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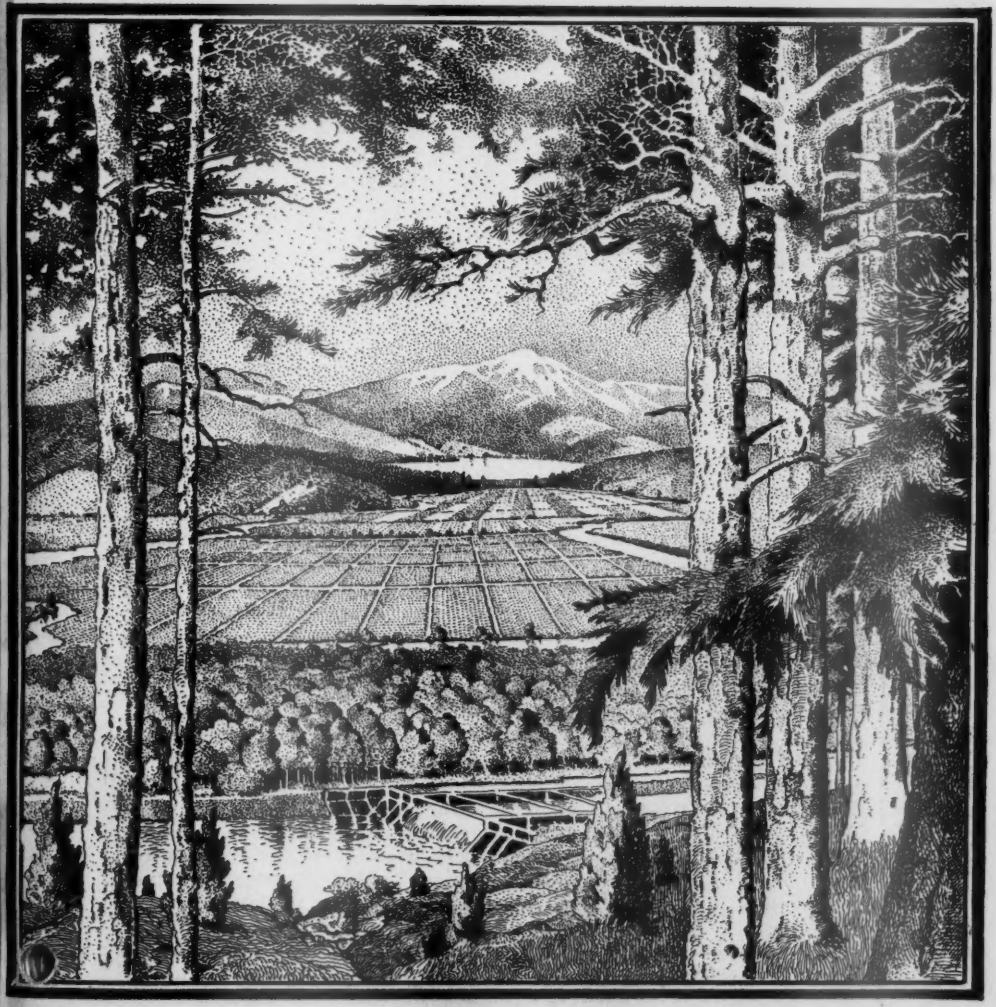

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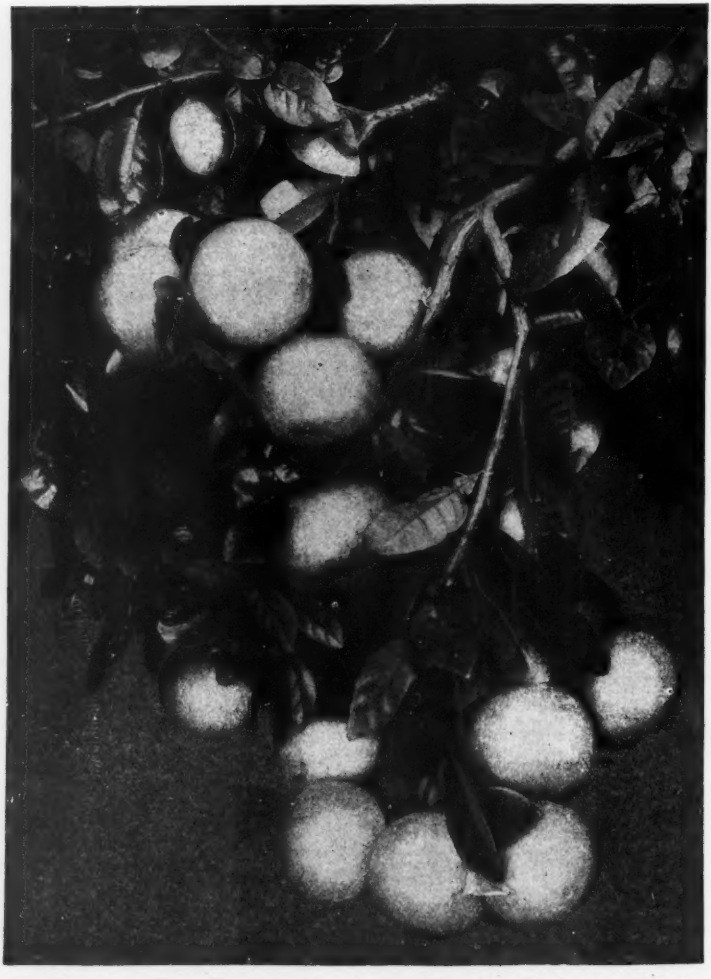

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H. M. SUTER, Editor

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VOL. XII. MAY, 1906. NO. 5

# NEWS AND NOTES

**Favorable Report**

To the many persons desiring the establishment of federal forest reserves in the Southern Appalacians and the White Mountains, it will come as most welcome news that the Committee on Agriculture of the House of Representatives has decided to make a favorable report on the bill creating these reserves. The Senate Committee having in charge a like bill sometime ago made a favorable report. While no further action may be expected at the present session of Congress, the matter is now in excellent shape for forcing it at the opening of the new session next fall.

**Hearing on Revised Bill**

In this connection we wish to call attention to the notable hearing on this bill, April 25 and 26, before the Committee on Agriculture of the House of Representatives.

The American Forestry Association, together with several of the State organizations, has been earnestly working to secure the passage by Congress of this measure, or similar ones, for a number of years. When the date of the hearing on the latest measure was announced by the House Committee, it was decided to make a strong plea before that Committee for the reserves, substantiated by convincing evidence of the pressing need for action. At a forestry meeting held at Charlotte, N. C., early in March, Governor R. B. Glenn, of North Carolina, was asked, in a resolution, to request the Governors of all States interested in the reserves, to appoint a committee of five citizens to represent their respective States at the hearing, and present individual evidence of the need of the reserves, and voice the general desire of the people. Accordingly, at the hearing on April 25 and 26, there were present some seventy-five persons, representing, in all, fourteen States, and including the Governor of North Carolina, and the Governor of New Hampshire—the latter accompanied by his entire council. Governor Glenn, as chairman of the assembled committees, was in charge of the presentation of evidence to the House Committee.

The first day's session was opened with a forceful address by Governor McLane of New Hampshire, on the subject: "The States within which these proposed forest reserves are to be located cannot be reasonably expected to establish and maintain forest reserves which are for the benefit of the entire eastern half of the United States, and the nation as a whole."

Governor McLane was followed by Mr. Theophilus Parsons, of Boston, chairman of the Massachusetts delegation, who spoke on the manufacturing interests and water powers as affected by the forest reserve problem, particularly in New England. As a representative from the South, Major Augustine T. Smythe, of Charleston, S. C., spoke along the same lines, presenting much valuable information as regards the depreciation in values of water powers as a direct result of the cutting of timber. The effect of the denudation of the forests on the navigation interests was discussed by Mr. C. C. Goodrich, General Manager of the Hartford and New York Transportation Company, Hartford, Conn., speaking for New England, and Prof. L. C. Glenn, of Vanderbilt University, Nashville, Tenn., on the part of the South. Dr. Eugene Allen Smith, State Geologist of Alabama, also touched on this subject and the extent of the damage wrought to the shipping interests of the South. Prof. J. H. Stewart, Director of the Agricultural Experiment Station, Morgantown, W. Va., explained the interest of the farmer in the proposed Southern reserve.

Rev. Edward Everett Hale, Chaplain of the Senate, and a pioneer in the movement for the White Mountain Reserve, made the opening speech of the second day's session, on April 26. Agricultural Commissioner E. J. Watson, of South Carolina, was called upon to explain the relation of agriculture to forestry, and to discuss the effect of forest denudation upon agricultural prosperity. Mr. Harvey N. Sheppard, of Boston, representing the Appalachian Mountain Club, urged, in a brilliant address, the creation of the reserves as a breathing space for the crowded inhabitants of the thickly settled East. Governor R. B. Glenn closed the arguments in an eloquent appeal for prompt action.

The hearing in its entirety was a remarkable one. There has seldom been called together for a like purpose—viz., to plead for action by Congress on any measure—a set of men speaking for so many varied interests, and representing so much invested capital in the industries which have in a large measure brought America to the front as a producing nation.

As matters now stand for the action in Congress on the bill for these reserves cannot be had before the next session. But meantime the many friends of the measure should continue actively at work in creating sentiment favorable to its passage. It is only the strongly expressed wish of the people that will bring final and favorable action. Much headway was made the past twelve months, and at no time since the geginning of this movement has the outlook for success been so bright.

**Forest Service Lumber Statistics**

According to such a high technical authority as the *Mississippi Valley Lumbermen:* "The first report of lumber statistics gathered by the Forest Service of the Department of Agriculture, and presented at the annual meeting of the National Lumber Manufacturers' Association, at St. Louis, though admittedly incomplete, makes so good a showing as to warrant the belief that this section of Government work will become immensely valuable during coming years." It further comments as follows: "Those who have, in the past, attempted to gather statistics of this character from a comparatively small area of country know the difficulties that must be overcome even where the compilers have personal knowledge of the business and personal acquaintance with a very large proportion of those from whom the information must be obtained. Errors of commission and errors of omission have not been missing from the statistics compiled by the lumber trade journals that have been engaged in this class of work for more than a quarter of a century. Persistent effort in the form of second, third and fourth requests have failed to bring reports from many manufacturers, and after an almost complete degree of accuracy was reached in the Northern pine statistics, the manufac-

turers suddenly decided that no more detailed figures would be available for publication.

"For the purpose for which these statistics were intended—to inform the readers of the trade journals not only the amount of available stock, but where it could be found, as well—a generalization or grouping of totals did not answer, so, from that point of view, the statistics given out by the Forest Service are not especially valuable. They are valuable, however, as affording information of the extent of the lumber industry, the distribution of the various woods that enter into lumber commerce, and the rapidity with which the timber resources of the land are being exploited. In the table published in the report of the St. Louis meeting, the Forest Service estimates that from seventy to eighty per cent of the total lumber cut is represented. The totals were a little short of 27,000,000,000 feet, indicating that the total cut of the country was betweent 35 and 40 billion feet of lumber. But these figures are only a part of the work that has been undertaken by the Forest Service in co-operation with the National Lumber Manufacturer's Association, and it is only in connection with the other work that they attain their greatest value. It is the aim of the Service to obtain figuees of the total timber resources of the country, the increase by growth and the total drain upon those resources. When all this information is secured with a fair degree of accuracy, it will be both valuable and interesting."

**Forestry in Canada**

The recently issued report of the superintendent of forestry for the Dominion of Canada, for the fiscal year ended June 30, 1905, contains some interesting information regarding the progress of forestry in Canada. Superintendent Stewart points out the great difference in forest conditions between the countries of the Old and New World, and states his conviction that European methods are not entirely practicable in Canada. The report emphasizes the necessity of trained foresters in the Dominion, and advocates educational advantages in forestry. Strong emphasis is laid upon the necessity for adequate fire protection. The fire ranging system, which has been put into operation in some districts with considerable success, is described.

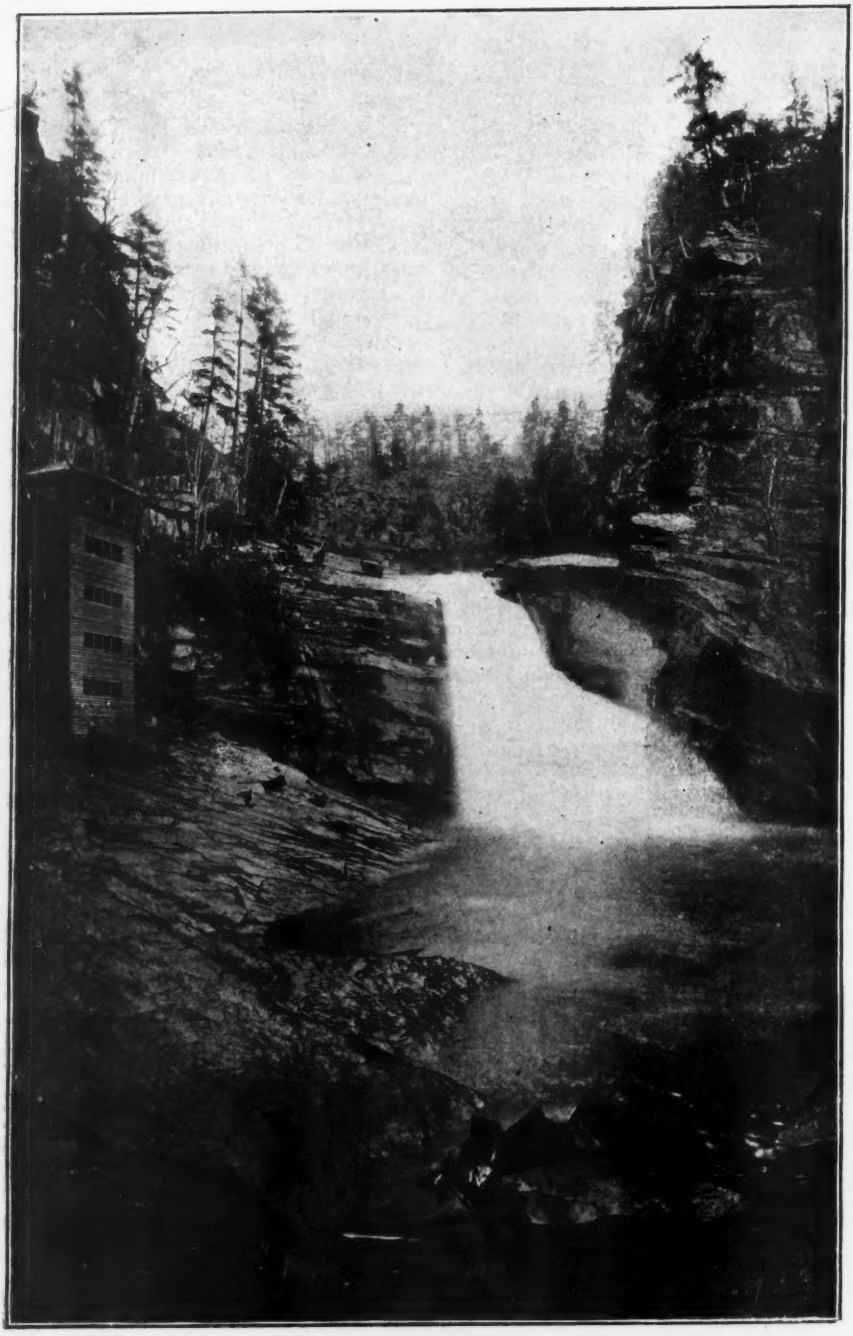
The importance of proper cutting is emphasized by Superintendent Stewart, as second only to fire protection. Forest reserves have already been created in the Dominion, but only for two reservations have working plans been instituted.

The distribution of seedling trees for forest planting, to settlers in the Northwest—a co-operation system, which was begun in 1901—is alrealy assuming vast proportions. Some 1,860,000 were listributed during the year.

**Forest Fires**

An unusually dry spring has made conditions for forest fires peculiarly favorable in the Northwest. Close to Vancouver, B. C., fires of considerable magnitude have destroyed much valuable timber, and a fire in Lynn Valley destroyed hundreds of cords of wood and shingle bolts belonging to the Hastings Shingle Manufacturing Company. The mining town of Berlin, Wash., was almost completely destroyed, and along the Great Northern and Northern Pacific railways forest fires have kept firefighters at work. Skyomish and Monroe, Wash., were for a time seriously threatened, previous to a heavy rainfall. Owing to the failure of the Washington Legislature to provide sufficient funds to carry on the work of fire fighting beyond last year, the timber owners, headed by the Weyerhaeuser syndicate, are providing a fund, and wardens will be placed in the field to organize volunteer crews, where fires are discovered.

The most serious damage caused by forest fires so far this season, has been done in the upper peninsular of



Tallulah Falls, Georgia.

There is here a succession of beautiful cascades which have within a short distance an aggregate descent of 335 feet, within the boundaries of the proposed Southern Appalachian Forest Reserve.

Michigan and northern Wisconsin, where reports indicate 200 square miles are affected. Newspaper reports from Escanaba and Gladstone, Mich., state that the towns of Saunders, Quinnesec, Shaffer, Ralps, Salvoie, Cornell, Woodlawn, and Talbot have been completely destroyed, and several other towns seriously threatened. The exact loss is hard to estimate, on account of the meager details, but the loss in timber alone will be considerable, while the damage to farms, homes, live stock, and real estate will be very heavy.

**Chair of Lumbering**

At the meeting of the National Wholesale Lumber Dealers Association, held at Chicago in May, 1905, a resolution was adopted to secure funds for the endowment of a chair of applied forestry and practical lumbering at the Yale Forest School. A committee was appointed to have charge of raising the fund.

At the annual meeting of the association, held recently in St. Louis, Mr. F. E. Weyerhaeuser reported for the committee the progress of its work. Some difficulty was encountered in getting the work under way, owing to the large territory to be covered. Accordingly it was January of the present year before the committee undertook the active work of soliciting subscriptions. Since that time, however, the work has gone steadily forward and $54,601.20 has been raised through 158 subscriptions, from the following sources:

| | | |
|---|---|---|
| Arizona District | 5 | $ 80.00 |
| Lumber trade journals | 1 | 100.00 |
| Pacific Coast Lumber Manufacturers' Association | 1 | 500.00 |
| Pennsylvania State | 1 | 1,000.00 |
| New York State | 1 | 1,000.60 |
| Michigan State | 3 | 1,250.00 |
| Sugar Pine Manufacturers | 2 | 1,250.00 |
| Southern Cypress Manufacturers' Association | 19 | 2,175.00 |
| National Wholesale Lumber Dealers' Association | 43 | 4,350.00 |
| Northern Pine Manufacturers' Association | 18 | 19,200.00 |
| Yellow Pine Manufacturers' Association | 48 | 20,646.20 |
| Hardwood Manufacturers' Association of the United States | 16 | 3,050.00 |
| | 158 | $54,601.20 |

The members of the committee having this matter in charge are Messrs. William Carson, J. T. Barber, J. B. White, C. I. Mallard, N.W. McLeod, E. G. Griggs, R. A. Long, R. H. Downman, I. C. Enochs, J. L. Kaul, and F. E. Weyerhaeuser. Mr. George K. Smith is secretary of the committee.

**New Hampshire Meeting**

The annual meeting of the Society for the Protection of New Hampshire Forests was held at Concord, N. H., on May 9. The meeting was an unusually interesting one. Mr. Asa F. Williams, forester of the Berlin Mills Company, addressed the meeting on the subject, "The Influence of Logging Upon Natural Reforestation." In addition there were papers by Prof. F. William Rane, of the Department of Horticulture and Forestry, of the State Agricultural College at Durham; Mr. Edwin A Start, secretary of the Massachusetts Forestry Association; Hon. Henry F. Hollis, of Concord (who has recently planted ten acres of white pine), and others. Dr. A. D. Hopkins, forest entomologist of the Department of Agriculture, spoke on "Insects Injurious to the Forests of New England," illustrating his talk with lantern slides.

A legacy of $5,000, left by Mrs. Julia B. Thayer, of Keene, N. H., was announced; also that Dartmouth College has placed its large tract of 26,000 acres under forest management in co-operation with the society, with the Forester, Mr. Philip W. Ayres, in charge. There were full reports upon the proposed forest reservations in the southern Appalachian and White Mountain regions, and the society expressed its hearty appreciation for the efforts that have been made looking to their establishment by the Senators from New Hampshire, by Dr. Edward Everett Hale, and by Governor R. B. Glenn, of North Carolina. Governor Glenn was elected a vice president of the society, Dr. Hale already being an honorary life member. The society has selected a list of correspondents in the several states of the Union to

assist in the campaign for national forest reservations in the East.

At this meeting action was taken looking toward closer affiliation with the American Forestry Association, viz., the society voted to become a sustaining member, which, under the amended by-laws adopted at the last meeting of the American Forestry Association, allows an organization joining in such a manner the privilege of representation on the advisory board of the association, one member of which is also elected a vice president of the American Forestry Association. Those, who will represent the Society for the Protection of New Hampshire Forests on the advisory board of the association, are Hon. Frank W. Rollins, Concord, N. H., president of the society; Mr. George T. Cruft, Bethlehem, president of the White Mountain Board of Trade, and treasurer of the society, and Mr. Philip W. Ayres, Concord, forester of the society.

**To Enforce Order in Camps**

The initiation of a large national irrigation project, giving employment to hundreds of laborers, is almost always followed by an influx of disreputable characters who attempt to establish themselves in or near the construction camps. They are most objectionable individuals and their purpose is to establish saloons, brothels and gambling houses. Their presence in the camps is invariably followed by a saturnalia of crime, drunkenness, robberies and murders.

In many states laws have been enacted prohibiting the establishment of saloons within a specified distance of any government works under construction; but in others apparently this important matter has been overlooked, and the engineer is helpless to protect the laborers from being wantonly robbed and frequently murdered. Even in states which have enacted these laws great difficulty is experienced in prosecuting the violators owing to political influence which the liquor element is able to bring to bear on state and county authorities. The processes of the law are so slow that the liquor sellers and gamblers openly boast they can delay proceedings against them until the works are completed, after which they are willing to give up their unlawful pursuits and abandon the temporary buildings occupied by them.

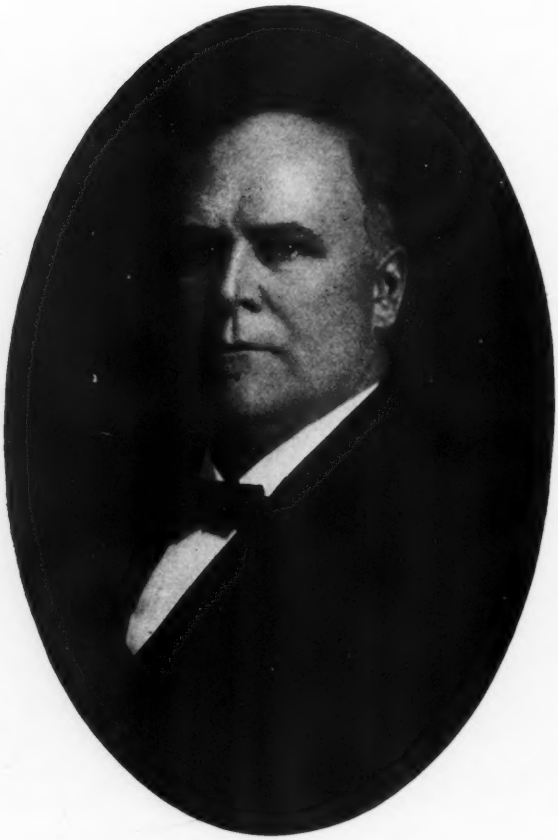
In Nevada the conditions at several points along the works became deplorable. The laborers, intoxicated by the vile decoctions of the dram shops, have been robbed by the gamblers or highwaymen and murders have not been infrequent. Several lynchings have occurred when the hold-up artists have been taken red-handed by the infuriated laborers.

The Department of Justice has been called upon to assist the Reclamation Service in driving out these criminals and in keeping liquor off the government reservation and out of government camps. Thus far repressory measures have proved unavailing, owing to the impossibility of securing prompt action in local courts. It is hoped that with the co-operation of the Department of Justice the reign of lawlessness on several of the government works may be ended and some of the rascals punished.

GOVERNOR JOHN McLANE OF NEW HAMPSHIRE

ONE OF the most forceful of the addresses given before the Committee on Agriculture, of the House of Representatives, at the time of the recent hearing on the bill for the creation of national forest reserves in the White Mountains of New Hampshire and the Southern Appalachian Mountains, was that delivered by Governor John McLane, of New Hampshire. So vitally does the government of the State of New Hampshire, in which the proposed White Mountain Reservation is located, feel the need of this reservation, that it was unanimously voted that the Governor and his council should attend the hearing before the House Committee and exert all possible influence toward securing the reservation.

John McLane was born at Lennoxtoun, Scotland, February 27, 1852. He was educated in the public schools at Manchester, N. H., and learned the trade of cabinet maker, and since 1876 has been engaged as a manufacturer of postoffice furniture and equipments. He is now President of the McLane Manufacturing Company; also President of the Lonhegan National Bank, and variously connected with other institutions in his State. He was a member of the New Hampshire House of Representatives, 1885; State Senator, 1891–3, and President of the Senate at both sessions. He was elected Governor in 1905.



GOVERNOR R. B. GLENN OF NORTH CAROLINA

SELDOM has forestry found a more ardent and enthusiastic advocate than Governor Robert Brodnax Glenn of North Carolina. Among the first in North Carolina to discern the value of forestry to his State, and appreciating the vast interests at stake, he has ardently championed the cause and by the force of his example and his unflagging interest gained the support of all substantial citizens. Just now the State is beginning to awake to its needs and to realize more fully the magnitude of its interests involved through destruction of the forests, and the many advantages to be derived from the proposed Appalachian Forest Reserve. Governor Glenn's prompt and intelligent support of the forest movement is characteristic of his work in other lines.

Robert Brodnax Glenn was born in Rockingham County, North Carolina, August 11, 1854, the son of Chalmers L. and Annie S. Glenn. He received education through a tutor at home, later attending the high school at Leaksville, N. C., Davidson's College, N. C., and finally Pearson's Law School at Richmond Hill, N. C. Upon completing his course at the latter school he engaged in the general practice of law, and since 1878 has been a member of the firm of Glenn, Moody and Hendren, at Winston, N. C. He has been assistant director for the Southern Railway, attorney for the Western Union Telegraph Company, member of the State Legislature (1881), solicitor for the State of North Carolina (1886), and district attorney for the United States, 1893-97. He was elected Governor of North Carolina in 1905.

# THE DRAINAGE OF THE EVERGLADES

BY

DR. JOHN GIFFORD

APROPOS of the Steenerson bill for the reclamation of swamplands, I believe, although I have no statistics at hand, that the area of good land under cultivation in the United States which has been reclaimed by drainage, equals or exceeds that reclaimed by irrigation; and the same applies to the amount of land still unreclaimed. Our largest swamp areas are still wildernesses because their very vastness renders reclamation by private enterprise impossible. It is, however, undoubtedly quite as much the function of the federal government to remove water from land in the east as it is to put water on the land in the west.

The vast swamp area known as the Everglades in the part of Florida which is tropical is of such size that private enterprise cannot handle it and it is doubtful even if the State of Florida is equal to it. It is a project of such magnitude that in order to be done properly, federal aid is necessary. It is a pet project of the present Governor of Florida and the work of reclamation has actually been begun both by the State and the Florida East Coast Railroad. These operations, however, compared with what there is to do are like the merest nibblings on the edge of an enormous cheese. The reclamation of the Everglades deserves attention from federal authorities, firstly, because a large part of it is still unsurveyed federal land, and, secondly, because it is capable of producing a great variety of crops at a time of the year when they cannot be produced elsewhere in the United States. Almost every year an enormous quantity of winter vegetables is produced on the edge of the Everglades. The rainfall was exceptional this year, however, so that glade crops were impossible. The excessive and unusual amount of water has rendered trips by canoe into the Everglades possible this winter.

The writer with a party of friends took advantage of this opportunity to visit Seminole village on one of the islands in the Everglades.

The Everglades are, in part at least, surrounded by a rocky rim. This rim is mostly limestone rock. Here and there streams break through the rim, and thus the region is drained. In dry times the flow from the streams and the evaporation are sufficient to keep a large zone on the edge of the Everglades comparatively dry and fit for cultivation. In the saucer-like depression within the rocky rim there are immense springs which are fed from some inexhaustible source far up the country. When excessive precipitation is added to this spring supply the rocky water courses flowing into the sea are unable to carry off the water and the water-table which is ordinarily close to the surface is raised so far above it that navigation with a canoe is comparatively easy. One can follow for miles the trail of the Seminole canoes through the sawgrass.

The rocky, pine-covered land occasionally juts into the marshes like fingers, and vice versa long slender minor glades run into the pine land.

Here and there throughout the Everglades are islands which are entirely different from the pine land. On these islands the Seminole Indian lives and cultivates his crops. In the marshes he hunts alligators and other wild animals. The islands are rocky just like the pine land rim, in fact the whole of the Everglade region is un-

derlain with limestone rock, sometimes close to the surface, even exposed to view, while in other places it is covered with several feet of partly decomposed vegetation.

On these islands we recognized several familiar trees, such as *Magnolia glauca,* so common in the south and sen as far north as Long Island, the cypress, the live oak and the cocoa-plum, mingled with such unusual trees as the wild calabash (*C. ovata*), etc. Here the Indians make their clearings and grow sweet potatoes, squashes, corn, etc. Here also are limes, rough lemon, sour orange, and other trees planted by the Indians.

When one tries to land on one of these islands, the centre of which has been cleared mainly by girdling and fire, he realizes why the Seminole wears no pants. The water through which one must wade to approach the farm was waist deep this winter. The wetting did not concern us as much as did the thought of mocasins which frequent such places.

The Seminoles are much like other people in that some are clean, some are dirty, some industrious, some lazy; most of them fond of liquor and tobacco; fond of finery and plenty to eat, but they are peculiar in that they apparently have no political status. Although they were driven into this land and sought refuge here, they have no legal claim to it. They are neither citizens nor are they wards of the government. They have their own laws and do as they please. While peaceful they are never molested. The time is coming when these islands will be needed for truck patches. The most successful grower in Dade County, Florida, this season raised his crops on one of these islands. He is already clearing another. Additional islands are owned, and still other persons have their eyes on getting islands, and so on it will go until they are all used. Strange to say in order to grow truck successfully here, one must irrigate. The truck grower referred to above owns a long slender island. Down the

**Looking into the Everglades. One of the streams by which they are partly drained.**

middle of it winds a square trough of cypress boards. In the sides of this trough are holes; with a six-horse-power gasoline engine he pumps the water out of the Everglades and lets it out of the holes in the trough when and wherever he needs it.

The rocky bed underlying the soil covering of the Everglades is apparently still in process of formation. The water as it comes from springs is full of lime. Owing to evaporation and chemical reasons the lime is deposited on everything. Every leaf and twig is covered with it. Over the surface innumerable shells of snails may be seen floating. These finally drop to the bottom and are incorporated with the rock.

In the southern part of the Everglades there is an island called "Paradise Key," on which there are many large royal palms. How they got there is a mystery.

South of the Everglades stretching for miles to Cape Sable is the Great Mangrove Swamp. These mangroves are often large, fine trees and when accessible are being used for piling. A small quantity has been used for flooring and the bark is being shipped from this region for tnning extract. The black mangrove is also a valuable tree.

The main point of this article, however, is this: If Congress is hunting for swamps to drain they are here. There are four or five million acres of them. Here is opportunity for tropical expansion nearer home than the Phillipines. Here is an empire to conquer which reminds the forester somewhat of the famous "Landes" which are now reclaimed and one of the most healthful and productive provinces of France. But, strange to say, the Everglades are not unhealty. In fact the Indians claim that mosquitos are fewer there than in the dry pine land. This is probably due to the little fish that live in its streams. In general, animal life does not appear to be plentiful in

**Indians coming out of the Everglades in their canoes on the Miami River.**

these glades. Two or three hundred Indians, born hunters, constantly hunting can keep the fish and game animals in check over a broad area.

No doubt when ditches are dug tourists will tour these glades with comfort, just as they will in the course of a year or two cross the Keys to Key West, literally go to sea by train with the Straits of Florida on one side and the broad Gulf of Mexico on the other. The local papers report that Mr. Shonts, of the Canal Commission, while in Key West recently, said that he regarded the building of this railroad second only in importance to the Panama Canal project. It would seem that if private enterprise is capable of building a railroad across the Florida Keys to Key West it might also be equal to the task of draining the Everglades. Many of the canals which would be dug in the Everglades would serve at the same time for transportation purposes.

**A Group of Seminole Indians who inhabit the Everglades**

While land is so abundant and cheap even near the great centers of population the need for the reclamation of

vast swamp areas might, however, seem questionable. It is people that are needed more than land. At the same time this swamp land is highly productive so that in the long run its reclamation pays. Swamp lands lie idle at the very doors of our great cities. In Holland land is wrested from the sea while close by there is plenty of poor, cheap land to be had. The writer once visited a bleak heath-land tract in Holland, called "Amerika," where a company was endeavorngi to induce settlers to come and start a boom.

As Merriam points out in his bulletin on Life and Crop Zones, when a zone of one kind dips far into a zone of another kind there is great advantage. In the Everglades region we have a vast territory of humid tropical land extending northward so close to great centres of consumption that its ability to produce unusualy crops will some day be recognized.

There have been objections advanced to this old reclamation project. It is claimed on the East Coast that the lowering of the water table in the Everglades will remove the influence

**A Boatload of Alligator Eggs. In the center of the boat there are young Alligators just hatched.**

which such a body of water exerts on tempering the northers which blow across it. There may be something in this objection but opinions are so diverse on the subject that it is impossible to conjecture its effects. In case frosts are more severe after the drainage is completed the drainage would be blamed although the frost might really be due to other causes. The planting of trees over this area which would immediately follow its drainage would probably more than counteract the influence of the drainage. Since the water in the 'Glades comes mostly from deep springs it is warmer in cold weather and cooler in warm weather than the air.

It is the original cost of such projects which stagger one, but operations just as great have been completed or are in process of construction. When the Panama Canal is done and in working order we will regard it as a matter of course and wonder why some nation had not done it long ago. The great Gulf trade now all goes around the south of Florida and when one sees ship after ship loaded with valuable cargoes piled up hopeless wrecks on the Florida Keys with millions of dollars worth of human labor lost he realizes that a canal from Jacksonville to the Gulf in a saving also of coal and time, would in the long run prove a great investment.

So when one sees thousands of farmers working in poor sandy soil, which ought to be left to produce forest, he wishes that they might have some of the unreclaimed swampland which they are prevented from using in consequence of the great initial cost.

It is an indisputable fact that land which is easy to clear is usually cleared first and that lands which have been reclaimed by drainage and irrigation are really the lands which have the most lasting fertility and the greater productiveness. When we consider the smallness of the return and the loss of time and labor in working poor land over a period of many years the first cost after all counts for ltle. The man who pays five dollars an acre for poor land because he cannot afford to pay one hundred for good land is making poor investment.

One must beware drained lands which may be subject to flood in severe storms. On our eastern coast of the United States there are hundreds of acres of banked lands once carefully cultivated now swamp again. Drainage must be perfect to meet extreme conditions of storm. This means great and lasting works on a large scale similar to those of Holland.

The Everglades are higher than the sea. There is no danger of floods except from excessive precipitation. The water is constantly coming up from below. It is merely a matter of ditches. And ditches are merely a matter of money, men, and machinery. That work has begun is evidenced by the following note clipped from the *Miami Metropolis:*

"Information has reached the city that the dredge under construction at Fort Lauderdale for the State, to be used in digging a canal to drain the Everglades, as proposed by Governor Broward and the State Drainage Commission, was successfully launched on Monday, and will at once be fitted with the machinery, all of which is on hand, and the craft made ready to begin dredging operations within a month.

"The hull of the dredge is 50x112 feet in size, and it is said the machinery to be installed will have a greater capacity than any similar dredge ever constructed in the State. Governor Broward will come down again and be present when the craft is put to work on the project which is just now agitating and interesting the State."

But the Drainage Commission has ordered the special drainage tax to be severed from this year's collections until pending litigation has been settled. This means the suspension of the "Everglade scheme" for the present at least, though there is apparently nothing to prohibit Governor Brownard from continuing the work of building dredges with the money already on hand in the Internal Improvement Fund.

# BLACK CHERRY (Prunus Serotina)*

## VI.—Notes on Forest Trees Suitable for Planting in the United States.

### DISTRIBUTION AND MANNER OF OCCURRENCE.

The Black Cherry flourishes throughout the eastern half of the United States from Nova Scotia to Tampa Bay, Florida; westward it grows to the Missouri River in southeastern South Dakota, to eastern Kansas and Nebraska, Indian Territory, and Texas; and extends through Mexico and along the Pacific Coast of Central America to Peru. In the northern extremity of the Lake States its distribution is limited to shaded lake shores and banks of streams, while in places it fades out entirely and is replaced by the Wild Cherry.

Although growing over a wide range of territory, the region for economic planting should be limited to the region extending westward from Indiana to eastern South Dakota, and Kansas, and southward along the high moist slopes of the Appalachians.

Throughout its range it is common under varying conditions of soil and exposure in open places in hardwood forests, but is nowhere abundant, though occasionally in the most favorable locations numerous groups of trees are found.

### CHARACTERISTICS OF GROWTH—ASSOCIATE SPECIES.

Because of its adaptability to different conditions the Black Cherry varies greatly in form and size, depending on the region and locality in which it grows. In New England it is of medium size, 30 to 50 feet in height, with a diameter varying from 10 inches to 2 feet. In the Middle States and westward it becomes larger, with a height of 40 to 70 feet, and with sometimes a diameter of 3 feet, although it becomes smaller along the northern limit of its range. In the moist residual soil of the upper slopes of the southern Alleghenies it reaches its maximum growth; here a height of 100 feet and a diameter of 5 feet is often attained.

When forest-grown the trunk of the Black Cherry is long and slender, free from branches, and surmounted by a comparatively small, open crown composed of large, irregular branches. In the open the crown becomes more spreading, but seldom massive like that of the oak and chestnut. The root system is extensive, especially on dry, sterile soil, where the heart roots go deep in search of moisture. A considerable lateral system of surface roots is also developed. The tree is moderately shade-enduring.

The rate of growth is so much dependent upon climate and soil conditions as to cause different opinions concerning its real capabilities. Under the most favorable conditions it is a rapid growing tree, while in a very cold or exceedingly warm climate, and in unfavorable soil, the growth is rather slow. In a deep, rich soil and a mild climate, trees 25 to 30 years old have been known to make an average annual diameter growth of four-fifths of an inch, but the valuable, dark-colored timber is not produced until the age of 60 to 80 years. On the whole, the Black Cherry may be considered as a rapid-growing, short-lived species.

The trees associated with the Black Cherry include nearly all of the common hardwoods, among which may be mentioned the Beech, birches, oaks, hickories, Black Walnut, Ohio Buckeye, and the maples.

### WOOD—ECONOMIC USES.

The wood is light, strong, rather hard, with a close, fine grain which

*Furnished by U. S. Forest Service.

takes a beautiful polish; it is brown or red in color at maturity, with thin, yellow sapwood. It is suitable for cabinetmaking and interior decorating, and for such purposes has been so extensively used that he largest and best trees of the country have now been cut. For general construction work or when exposed to the weather the wood is not good. This lessens the value of the tree for general planting.

SOIL AND SITE.

The Black Cherry is capable of existing in a variety of dry situations, but it is only in the moist, well-drained, rich soils of mild climates that the maximum development is attained. The tree thrives on bottom lands and does fairly well on sandy or rocky uplands if the soil is rich and penetrable. In the West its success as a forest tree has been variable, although on the whole encouraging. In the loess soil of western Iowa, on dry ridges and bluffs, and in black drift soils it makes a rapid growth.

PROPAGATION.

Birds are the natural agents of seed dissemination for the cherry, and by them the tree has been broadly distributed. This means of starting reproduction can hardly be depended upon, however, because the cherry pits are scattered too thinly and many of them are lost through falling in places unfavorable to germination. On limited areas in the South natural reproduction is good on open or partly shaded land, but in the North and West it is often lacking.

As the Black Cherry is easily transplanted, it is better to plant the seeds in a nursery and transfer the trees to the final forest site when one or two years old than to attempt to grow young trees by planting seeds where the trees are to stand.

The fruit, which is borne profusely almost every year by trees in the open and less frequently by those in the forest, ripens in late August or early September and may be collected by hand from low trees or from tall forest trees by shaking it down upon canvas. The pulp should be washed off and the surface of the pit dried to prevent moulding. For winter preservation the pits should be stratified in moist sand and placed on the north side of a building where they will breeze and not be thawed out too often or too rapidly by the sun. In the spring they should be planted in drills 8 to 12 inches apart for hand cultivation, or 2 to 3 feet apart if a horse cultivator is to be used, and covered about 1 inch deep. In the drill the seeds should be placed 2 or 3 inches apart. Planting must be done immediately after removing the pits from the sand, as even a partial drying at this stage is fatal. The transfer to the permanent plantation may be made in the spring when the trees are 1 year old, or they may be transplanted to nursery rows and allowed to develop for another year before the final setting.

The Black Cherry, since it endures considerable shade, may be planted rather close, either in pure stands or with associated species. The best species for a mixture are Boxelder, Red Oak, ash, elm, Silver Maple, Black Walnut, and Hackberry, the choice depending upon the locality.

ENEMIES.

The forest tent caterpillar (*Clisiocampa americana*) often seriously injures the Black Cherry by destroying the leaves. A fungus known as "black knot," by causing unsightly swellings on the branches, greatly disfigures the tree. In case of insect attack specimens should be sent to the Division of Entomology for identification and suggestions as to methods of control.

The leaves and fruit of Black Cherry contain hydrocyanic acid, which is a deadly poison; cattle have in rare instances been poisoned by eating the leaves, and it is said that children have died from eating the pits or swallowing the fruit whole. The fresh leaves are considered harmless, the poison being the result of chemical action in the withering leaves.

POSSIBILITIES AND USES.

For limited use as a mixture in prairie planting, especially on rather moist soil, the Black Cherry will find a useful place. In general, however, it is too short lived and of too limited economic value to be recommended for extensive planting in the West. As a nurse tree in forest plantations and where a luxurious foliage effect is desired it serves a useful purpose.

In the South and East, where it is of longer life and reaches its best development, it does not hold a high place because of the small size of the timber it produces and the presence of more valuable species. It is seldom used for ornamental purposes. With slight protection near the seacoast it has in a moderate degree shown its ability to withstand salt winds.

NOTABLE PLANTATIONS.

H. C. Raymond, of western Iowa, reports that 10-year-old Black Cherry grown in groves is 6 inches in diameter and 28 feet high, while Hardy Catalpa of the same age and in the same soil is of the same diameter but only 25 feet high.

In the Farlington plantation in Kansas the Black Cherry for the first few years gave great promise, but it is now deteriorating and, in many cases, dying.

In a block planted in 1878, containing 196 White Ash, 27 Catalpa, and 7 Black Cherry trees, the Cherry, when measured in 1901, was the largest both in diameter and height. The following was the average size of the 7 trees:

Average diameter at 1 foot from the ground ..... 8.4 inches
Average diameter at 7 feet from the ground ..... 6.4 inches
Average height.....34.0 feet
Average clear length of bole..19.0 feet

In another block containing 149 Black Cherry and 187 Catalpa trees the latter were entirely dominated by the Cherry. The average size of the Cherry was:

Average diameter at 1 foot from the ground ..... 5.6 inches
Average diameter at 7 feet from the ground ..... 4.0 inches
Average height.....32.0 feet
Average clear length of bole..19.0 feet

# THE FORT BAYARD WATERSHED

BY

J. C. BLUMER

FIFTY miles east of the Arizona line, and seventy miles north of the Mexican boundary, on the south slope of the Pinos Altos Mountains of southwestern New Mexico, lies the Ft. Bayard watershed. It embraces the headwaters of Cameron Creek from the United States military hospital at Ft. Bayard northward nearly to the continental divide as it culminates in Black Peak and the Twin Sisters. It thus practically abuts on the backbone of America. The twenty-two square miles of its general southerly exposure thus lie at an altitude of, roughly, 6,000 to 8,000 feet above sea level. Its southern and lower portion lies within the Ft. Bayard Military Reservation. The remainder, in July, 1905, became part of the Gila Forest Reserve.

The climate is warm and dry, but very much less so than is commonly thought. The average annual precipitation for the last thirty-two years on the neighboring plain has been 15 inches.* As the mountain tops are approached, the rainfall increases. It

*Stockman, Bulletin N, U. S. Weather Bureau.

is conservative to place the average annual rainfall for the watershed in question at 25 inches. There is one pronounced rainy season, and this comes in July and August, usually closing in September. At this season the sweltering people of our cities north and east would do well to come to southwestern New Mexico for their summer resort. The mercury finds the midsummer forenoon too short to rise higher than 85 degrees Fahrenheit, where the air is quiet and several degrees warmer than in the neighboring valley. Here is encountered at night a stream of cold air on its way from the mountains to the plain, there to replace the heated atmosphere of the day. The light snows and rains that usually fall during the mild winter suffer comparatively little by evaporation and transpiration. When the warmth of spring reappears, this moisture is quickly utilized by the vegetation, and it makes as quickened growth. As the drouth and parching heat of spring advances, this growth recedes to a minimum, takes on new impulse and fresh color with the benignant midsummer showers, only to dwindle and fade a second time with the approach of winter.

Photo by W. R. Matoon.

**General View of Bull Pine on North Slope in center and along stream. Juniper and Blue Oak Chapparal on other slopes. Streams run dry except at time of floods; and where fed by a few precious springs.**

rarely does it venture above this point. By noon the warm air has ascended to the mountain tops, comes in contact with cooler bodies here and is condensed, clouds begin to lower and descend through the keen atmosphere, and soon to refresh the entire mountain side by shade, or gentle shower, or bursting torrent. The nights are always cool. In autumn it is found advisable to pitch camp upon a knoll,

Thus we find in evergreen trees the phenomenon of two annual rings formed within one year. Since many

pronounced irregularities creep in, however, the determination of age by the counting of rings becomes a task of great difficulty. With the deciduous species the case is different. They usually present plainly but one annual ring per year.

The geologic structure of this drainage basin is varied and interesting. In the southeast portion the gentle swells are paved with great blocks of carboniferous limestone. Resting upon formation from northeast to southeast, and together with erosion, govern the minor topography. These audesite dikes are often sufficiently mineral-bearing to deflect a transit needle several degrees from its true course. Ascending nothward, we find resting upon this formation a body of rhyolite, a whitish acid, volcanic rock, its edge exposed in the form of several water-sculptured terraces that represent as many successive flows of lava.

Photo by W. R. Matoon.

**A Closer View of North Slope. Note the deltoid mass of rock fragments and debris in left foreground at base of slope. Immediately above the gully is ten feet deep. This slope not long ago was covered by an open stand of Bull Pine.**

this are certain bodies of quartzite of perhaps Triassic age. Mt. Humboldt, marking the easternmost point of the basin, is a cone built of this exceedingly hard material. All the remaining foothill portion of the watershed belongs to an eruptive formation, probably Older Tertiary. It contains certain bodies of volcanic sandstone. Ribs of intrusive rock, usually 8-12 feet wide, at intervals traverse this whole Surmounting this, and marking the line where the foothills merge into the mountain slopes, come bodies of conglomerate hundreds of feet thick. These are composed of volcanic material, but evidently deposited by water. Spread upon top of the conglomerate, and showing itself continuous throughout the watershed and beyond, is a layer of brown, Miocene or Pliocene basalt, whose edge forms the perpen-

dicular "rim rock," that is such a characteristic feature of the great west. This lava floor has been cut and chiselled by the drippings of the ages until we have to-day a whole system of mesas corresponding to the same, wellnigh perfect level. Above and beyond, reaching to the upper confines of the basin, rise other bodies of conglomerate, capped by still other strata of rhyolite and basalt.

The principal floral type is one of evergreen, orchard-like woodland, and of chapparal. This clothes all the basin except the strictly north slopes. These give rise to a deciduous oak (*Quercus gambelii*) mixed with western yellow pine in an open stand. The strictly evergreen type covers perhaps 90 per cent. or more of the area. The trees and shrubs of general distribution are as follows, named in order of importance from the economic standpoint: Two species of juniper, four of oak, two of pine, mountain mahogany (*Cerocarpus parvilfolius*), and *Garrya Wrightii.* The junipers are *Juniperus pachyphloea,* and *Juniperus monosperma,* bearing the local names of juniper and cedar, respectively. The oaks are *Quercus arizonica, Quercus hypoleuca, Quercus gambelii, Quercus emoryi.* The first is locally known as scrub oak; the third as water oak, white oak; while the second and fourth are usually combined under the names of red oak and black jack. The pines: *Pinus edulis,* and *Pinus ponderosa.* The foregoing are within each group placed in order of relative abundance, which, with the possible transposition of the pines, is also the order of present relative economic value.

There occur at least 26 other native species in the basin, nearly all growing along water-courses. The more promising of these for soil-binding on stream banks and other purposes, are: The poplars (*Populus wislizeni, Populus angustifolia*), box elder, Mexican walnut (*Juglans rupestris*), cherry (*Prunus salicifolia acutifolia*), willows (*Salix irrorata,* and two others), locust (*Robinia neomexicana*). Aside from tree fruit and small fruit, three species have been introduced, viz.: *Populus acuminata, Sapindus marginatus, Sambucus glauca.* The first-named makes a phenomenal growth (5 to 6 feet annually) where water is at hand. The soap-berry, next in order, shows promise in spreading to arid soil.

The chief use of such woody growth as will thrive on this watershed is its power for the conservation of soil and water. The secondary use is almost altogether for firewood and posts. With fuel in the neighboring town of Silver City worth $6.50 a cord, and juniper posts growing scarce at 40 cents each, this is also important.

The two species that deserve special mention are the alligator juniper (*Juniperus pachyphloea*) and *Quercus arizonica.* Both are of wide and general distribution, and maintain themselves well under adverse conditions, each on certain areas being the only woody plant to survive. The oak grows upon many steep slopes underlain by conglomerate, a soil cover that nature has taken untold centuries of selection to produce, and that man will probably find impossible to improve. The juniper thrives alone on many a grassy mesa, and reproduces vigorously on cut-over areas under surroundings that would kill any ordinary tree, root and branch. The latter is true of the other juniper as well, but this is limited in distribution. Junipers are of slow growth, and necessarily so in a climate like this. Yet the past season (1905) young growth has made an average of about 15 inches, much more than any other species on the same site. On large areas the junipers are capable of forming by far the best soil cover of anything now growing, and it is at least somewhat doubtful if anything better can be made to grow in the future. Moreover, they give the best quality of wood of any species on the watershed, both for fuel and posts. But junipers are hard to produce artificially. The best present way to favor them appears to be to provide the conditions best suited to the production of natural young growth. But it

Courtesy Forest Service.

**Stephen's Creek, Ft Bayard Nursery.**
**Run off during flood after hard showers, August 2, 1905**

Courtesy Forest Service.

**View taken in same place as preceding view one hour later.**
**The stream has receded to its normal volume, emanating from springs.**

would lead too far to discuss these here.

The stupendous physical forces that have upheaved and convulsed this bit of the earth's surface belong to the unknown past. The more constant and more silent forces that little by little have worn this watershed down to its present topography may never have been so active as at present. The not infrequent cloudbursts corrugate the upper, and especially the north slopes to a remarkable degree, bring down countless tons of rock debris and soil, tear great, gaping channels through the ranches of remarkably rich alluvial adobe soil along the streams, only further down to double devastation by spreading sand, rock, and uprooted trees over other fertile fields and orchards. During the rainy season it is the rule for roads to be impassable. At Ft. Bayard the pumping station and the water supply for the 500 patients has been put in jeopardy. The springs upon which the ranches depend are often obliterated.

Various recently eroded streambeds disclose 10 to 15 feet below the present flood plain the surface of an older one, rich with humus, and often supporting the roots of oak and walnut. While these trees were growing the stream was probably cutting a channel near by, and later overwhelming them by disposition. One stream has recently exposed a log cabin buried in about 12 feet of sediment. Now the cabin was such as white men build, hence was put up less than 400 years ago. Logs not long cut have been buried in various places. These are strong indications that active erosion and deposition takes place in certain cycles, and that these have continued from geologic down through historic time to the present day.

Local testimony bears witness, that a long period previous to 1903 had been very dry. The unusually heavy rainfall of the last two years has caused a tremendous amount of fresh gullying. It is possible that a new cycle of erosion has just begun. The severe grazing of past years that killed the grama sod over considerable areas, and caused such hardy shrubs as the mountain mahogany to succumb in large numbers, has without doubt contributed much to erosive activity. On several north slopes the last of the pines had been removed. The grasses and herbs of the ground cover had been literally shaved off by cattle and goats. The succeeding rains tore furrows into these slopes fully ten feet deep in places, and no further apart.

But it must not be inferred that had there been no grazing or wood-cutting there would have been no gullies. They would only have been fewer and less deeper. Certain rhyolitic terraces are now being cut clean. The rains are washing the white rock bare of all soil and humus. But it should not be concluded that a forest should stand on those rocks had there been no cutting. If all influence of grazing and wood-cutting, past and present, could be obliterated, the timber would still be scrubby, and it is more than likely that run-off and erosion should still take place to a remarkable degree. The factors that cause this large amount of run-off, erosion, and deposition can be safely put down in the following order: Character of rainfall, soil and rock, topography and vegetation, major factors. Grazing and wood-cutting, minor factors.

Being human factors, grazing and wood-cutting can be controlled. In fact, on the public land in the watershed, they are now being prohibited, and for the present rightly so. But 23 per cent. of the total area is either in private and territorial holdings, or in process of passing into such, the latter in some cases unrightfully. As a result of the prohibition much of this land is now being absolutely denuded of both grass and wood, nor can the bona fide owners be blamed. As an offset it is possible on certain areas of the public domain to reverse the factors of grazing and wood-cutting into that of tree-planting.

A forest nursery was established on the watershed by Mr. Geo. F. Clothier, of the Forest Service, in the sum-

mer of 1905. In December following, 450,000 western yellow pine, and some other seedlings, were growing in it, covering three-fifths of an acre. Planted in July, the pines had made at the end of the growing season two inches of top, and 8 to 12 inches of root, with some laterals one inch long. They will probably be ready to transplant in the fall of 1906, or summer of 1907. Their logical place is on the north slopes. Being indigenous here, they should succeed readily when planted. Moreover, these same slopes are in most immediate need of attention. This pine should presently do a great deal to relieve the local situation. The further and larger use of the planting will come in the form of an object lesson to the people of that section. But it must be conferred that to expect from these measures anything like a complete cessation of erosive activity on the watershed as a whole, even if reasonable time is allowed, would be the merest folly.

Courtesy Forest Service.

**Ft. Bayard Forest Nursery, showing seed beds of Bull Pine, photo taken 30 days from date of seed sowing, August, 1905.**

# RUBBER CULTURE IN THE PHILIPPINE ISLANDS

BY

W. I. HUTCHINSON

Forester, Philippine Bureau of Forestry.

ONE of the great problems to be solved in the development of every new country, apart from the principles of government, is, what products are best suited to the climatic and soil conditions at hand.

So important is this matter that every civilized nation maintains numerous agricultural stations and farms, not only at home but throughout its foreign possessions, in order that by careful experiments some light may be cast on this all important subject.

To the business man and the farmer of the Philippine Islands, this question is a very vital one. A considerable amount of capital is usually required to further a large farming project, and it is but natural that the first question that those whose money is involved should ask, is, what returns may we expect, and how long will it be necessary to wait before the first crop can be gathered?

Cocoanuts, hemp, and sugar cane have been planted in these islands for many years, so that the profit that may be secured from these products is generally well known. One reads daily, however, of the large returns received from cultivation in the East, of tropical crops other than those mentioned, and on comparing their gross proceeds with those from cocoanuts or hemp, is surprised to find that the crops planted to the greatest extent in any country, are not always the ones that yield the largest income.

It was undoubtedly on this account that rubber was first introduced into the Philippines, or perhaps it would be more accurate to say, into the Island of Mindanao, as it is in this section of the Archipelago that the greatest amount of planting has been done, through official channels.

Up to the present time Para rubber seed has been secured either from Sandakan, Borneo; or Singapore, through the Bureau of Forestry at Manila, and the Government of the Moro Province, Island of Mindanao. A few private ranch owners have also obtained small shipments of Ceara and Castilloa from Ceylon.

On account of the different methods of treatment, growth, etc., of these various species, they will be considered separately.

PARA RUBBER, *(Hevea brasiliensis)*.

During 1905 several small lots of Para seed were received in the Philippines. Eary in the year the Moro Government obtained 1,000 seed from Sandakan, Borneo, which were distributed among ranch owners and government officials throughout Mindanao; but of these seed few germinated, due without doubt to their infertility, and the lack of knowledge as to the proper methods of planting.

In October, 1905, the Bureau of Forestry, at Manila, received 5,000 seed from Singapore, 2,500 of which were sent to the Island of Mindanao, where they were planted in seed-beds at the Moro Government Experimental Farm, located on the Zamboanga Peninsula. Although every care possible was given the seed, which were planted within a month from the date of shipment, only about 400 of the total number sprouted. The average rate of growth of these nursery plants was about 18 inches in 50 days, seeds unfiled when planted.

In January of the present year the Moro Government again made a purchase of 6,000 seedlings, which had been raised from seed at the Lamao Forest Reserve, Bataan Province, by the Bureau of Agriculture. One

thousand of these seedlings were distributed to farmers in the vicinity of Zamboanga, and the remainder placed in seed-beds to await a favorable season for planting.

It is the intention of the Provincial Government to distribute a number of these seedlings among principal towns of the island, in order to ascertain which section of the country is best suited to rubber growing. A plantation will also be established on the Government Farm at an elevation of 25 feet above sea level, with sample plots in the surrounding mountains at different altitudes up to 1,200 feet.

CEARA RUBBER, *(Manihot glaziovii)*.

As far as is known to the writer, there are only two rubber plantations of any size in the Philippine Islands, and these are located on the Island of Basilan, Moro Province. These plantations are situated at 200 and 250 feet elevation, and contain 2,500 and 1,000 trees respectively. The soil of both of these areas is well drained, rich, heavy loam, with a small amount of volcanic gravel intermixed.

The following figures on the annual rainfall of the island were furnished by the Weather Bureau sub-station at Port Isabela, Basilan:

| | | Inches. |
|---|---|---|
| Year 1903, | total rainfall, | 65.30 |
| 1904, | total rainfall, | 74.25 |
| 1905, | total rainfall, | 42.43 |

The Ceara seed, after having been en route for eight months, were filed and planted directly to stake. At the lower elevation 2,500 out of 3,000 seed germinated, while at 500 feet something over 1,000 plants were obtained from 1,500 seed.

The following measurements made by the writer, will be of interest to all rubber growers, and as far as is known compare favorably with the growth of other trees of the same species and age, planted in the East:

Ceara rubber, elevation 500 feet; planted 15x15 feet; age, 7 months 5 days; number of trees measured, 43; average height, 12 feet 5 inches; maximum height, 17 feet; elevation, 200 feet; planted, 15x15 feet; age, 5 months 15 days; number of trees measured, 65; average height, 9 feet 9 inches; maximum height 13 feet.

CASTILLOA RUBBER, *(Castilloa elastica)*

A small Castilloa plantation, containing some 400 seedling trees irregularly spaced, has recently been set out on the Island of Basilan at an elevation of about 50 feet above sea level. The soil on this situation is a rich, heavy loam which has been washed down from the surrounding mountains, and contains but a small amount of gravel.

The measurement of 45 plants in the seed-bed, which are slightly larger than those set out in the plantation, gave the following results:

Castilloa rubber, age, 4 months 25 days; number of seedlings measured, 45; average height, 17 inches; maximum height 29 inches.

After watching the growth of Para and Castilloa seedlings in nursery beds, and Ceara trees in plantation, it is the foresters opinion that all of these species are well suited to the climatic and soil conditions as found in the Island of Mindanao.

Rambong *(Fiscus elastica)*, the other great rubber producing species under cultivation, has been planted singly in private grounds in many towns in the islands. All seem to thrive well.

Which of these four species will give the greatest returns per acre in the islands is a question which time alone can solve. Almost every large ranch owner in the eastern part of the Island of Mindanao will plant more or less rubber this year. Plans are being made to try all the principal kinds of rubber trees, and it is hoped that the species best adapted to the Philippines may be determined in the near future.

With the ever increasing demand for rubber, the limited areas suitable for its production, and the rapid exhaustion of the jungle product, it will doubtless be many years before the supply ever in a small measure be able to meet the demand.

In this new country we have been slow in starting to plant rubber, but the first step in the right direction has been taken, and the day may not be far distant when the Philippine Islands will be reckoned as an important factor among the rubber producing countries of the world.

## History of Past Month in Government Forest Work

**Veneer Stock in 1905**

Probably no branch of forest utilization, with the possible exception of the manufacture of pulpwood, shows such rapid development in this country as the veneer industry. Until very recently the opinion has prevailed that the kinds of timber which could be made into veneer were very limited in number, but the reports furnished by the veneer producers to the Forest Service include 24 species. Many of these, to be sure, are now cut in unimportant quantities, but the tendency to experiment with new woods is clearly shown.

The following statement as to the kinds and quantities of wood used for the manufacture of veneer stock in 1905 is compiled from the reports furnished to the Forest Service by 93 firms. It should be noted that the total amount of wood used, 138,646,000 feet, is in log measure. As the amount of lumber actually cut from the log averages about 20 per cent greater than the log measure, it is safe to say that the timber used for veneer stock would have made some 166,000,000 feet of ordinary lumber.

*Wood used for veneer stock.*

| Kind. | Feet, log measure | Per cent of total |
|---|---|---|
| Red gum | 29,739,000 | 21.5 |
| Yellow poplar | 20,513,000 | 15.0 |
| Maple | 18,643,000 | 13.4 |
| Cottonwood | 13,942,000 | 10.1 |
| White oak | 10,639,000 | 8.0 |
| Birch | 9,983,000 | 7.0 |
| Basswood | 8,994,000 | 6.5 |
| Pine | 5,315,000 | 3.8 |
| Elm | 4,309,000 | 2.3 |
| Red oak | 3,892,000 | 2.8 |
| Ash | 1,893,000 | 1.3 |
| Beech | 1,200,000 | .8 |
| Other species | 9,584,000 | 6.9 |
| Total | 138,646,000 | 100.0 |

All species for which a total cut of less than 1,000,000 feet was reported are tabulated, together with mixed timber, under the heading "Other species," which includes sycamore, tupelo, chestnut, hickory, pecan, butternut, cherry, spruce, cypress, hackberry, locust, and willow.

**Reserve Timber Sales**

The demand for lodgepole pine ties by the western railroads, which prefer them to any other because of the ease with which they take preservatives, has greatly increased the market value of the Rocky Mountain forests in northern Colorado, Wyoming, eastern Idaho, and southern Montana, where lodgepole pine is the predominant tree. These forests are largely within existing or proposed national forest reserves, and are consequently under government control, so that the Forest Service has felt the need of preparing plans to permit the sale of such mature timber in them as may be safely spared. During the past year a working plan was completed for about 46,000 acres in the Wyoming Division of the Medicine Bow Reserve.

It was found in the first place that the protective value of the forest as a cover for the watersheds is so great that any utilization of the timber crop must be subordinated to it. Throughout the region the control of stream flow by the forest cover is the prime consideration.

The mining industry, which is of high importance, will not be hampered by the disposal of reserve timber, since all the mining claims located in or near the tract include timber sufficient for the needs of the owners. The pres-

ent moderate grazing of cattle is carried on without risk to reproduction of the forest.

The Medicine Bow Forest Reserve contains the largest continuous body of lodgepole pine to be found in the Rocky Mountains. The timber on the tract for which the plan was made is accessible; tie cutting has been carried on in the reserve for some years; and it was definitely known that all the timber which could safely be removed would find a ready sale. Measurements in the woods and careful studies of the rate of past growth and of the forest's power of self-renewal furnished data from which the government foresters calculated what the forest can be expected to yield and what per cent can be cut safely now. It was found that 165,000,000 feet B. M. of lodgepole pine could be taken out and yet leave a large percentage for future crops. Special studies were made of the injury to which the forest is liable from insect attack and fungus, from windfall and fire. Local market conditions and the methods and cost of lumbering were investigated to see whether improvements and economies might not be instituted, as well as to fix upon a fair stumpage price.

**Products of Hardwood Distillation** Reports made to the Forest Service by 58 hardwood distillers have been compiled, so as to give the following preliminary statement of the number of cords of hardwood required by this industry and the volume of its products. The woods almost universally used are beech, birch, and maple, only a little over 1 per cent being oak and chestnut.

| State. | Wood used. | Products. | | |
|---|---|---|---|---|
| | | Alcohol | Acetate. | Charcoal. |
| | *Cords.* | *Gallons.* | *Pounds.* | *Bushels.* |
| Pennsylvania | 208,861 | 2,242,899 | 39,573,508 | 7,890,346 |
| New York | 113,036 | 1,091,871 | 24,188,234 | 4,075,595 |
| Michigan | 239,992 | 1,246,121 | 14,778,695 | 8,193,387 |
| Other States | 8,522 | 93,361 | 510,777 | 2,643,955 |
| Total | 570,411 | 4,674,522 | 79,051,214 | 22,803,283 |

**Consumption of Tanbark** The preliminary statement of the consumption of tanbark in 1905 is compiled from the reports of 440 firms to the Forest Service. These firms purchased hemlock and oak bark during the year as follows:

*Bark purchased.*

| Kind. | Number of cords. | Per cent. |
|---|---|---|
| Hemlock | 766,268 | 72.3 |
| Oak | 293,758 | 27.7 |
| Total | 1,060,026 | 100.0 |

The bark purchased was obtained from the various States as follows:

*Hemlock bark.*

| State from which obtained. | Number of cords. | Per cent. |
|---|---|---|
| Pennsylvania | 379,733 | 49.5 |
| Michigan | 219,852 | 28.5 |
| Wisconsin | 68,247 | 9.0 |
| West Virginia | 37,812 | 5.0 |
| Maine | 29,700 | 3.9 |
| New York | 13,638 | 1.7 |
| Vermont | 7,451 | 1.0 |
| Other States | 10,595 | 1.8 |
| Total | 766,268 | 100.0 |

*Oak bark.*

| State from which obtained. | Number of cords. | Per cent. |
|---|---|---|
| Virginia | 68,764 | 23.4 |
| California | 48,144 | 16.4 |
| Pennsylvania | 46,903 | 16.0 |
| West Virginia | 37,890 | 12.9 |
| Tennessee | 28,599 | 9.7 |
| North Carolina | 27,876 | 9.5 |
| Kentucky | 17,648 | 6.0 |
| Maryland | 7,423 | 2.5 |
| Georgia | 4,457 | 1.5 |
| Ohio | 4,123 | 1.4 |
| Other States | 1,931 | .7 |
| Total | 293,758 | 100.0 |

**Forest Planting Stations** Seven different states now have eight forest experiment stations, established during the past year, for cooperation between the Forest Service and State forest commissions and agricultural colleges. These stations are designed to meet the growing demand for detailed information on the propagation of forest trees in various regions.

As a result of regional studies and special investigations, the Forest Ser-

vice is already in possession of very complete data on tree growing for protection and timber supply, and this information is gladly supplied upon request. There are many questions, however, regarding new species, nursery methods, mixtures, spacing, and cultivation which can not be satisfactorily settled by studies of existing plantations. These matters will be investigated by a long series of systematic experiments, now under way at the new stations.

Arrangements have been made for experimental forest planting in cooperation with the New York State Forest, Fish and Game Commission, at Saranac Inn in the Adirondacks; with the Michigan Forestry Commission, at Roscommon; with the University of Michigan, at Ann Arbor; with Berea College, Kentucky; with the State Agricultural Colleges at Ames, Iowa, Fargo, N. Dak., and Agricultural College, Miss., and with the sub-station of the University of Nebraska, at North Platte. The work contemplated needs constant expert supervision, and great care has been exercised to limit the stations to regions where additional data on forest planting are needed. Most of the stations are at institutions where regular courses in forestry are given, and the work is directed by the forester in charge.

The co-operating institutions in most cases contribute the necessary land, and share all expenses for material and labor equally with the Forest Service. The Service passes upon all plans and directs the general operations. The results are the joint property of the co-operating parties.

**Production of Tight Cooperage**

The following preliminary statistics of the production of tight-cooperage stock in 1905 are compiled from the reports of 124 firms to the Forest Service. The number of staves reported is 158,988,000, and the number of sets of heading, 8,030,000.

The importance of white oak to the tight-cooperage industry is shown by the fact that over 92 per cent of the staves and 88 per cent of the heading were manufactured from it. It is also important that over one-third of the staves and heading reported were manufactured for alcoholic packages, which require the highest grade of white oak, and that 31 per cent of these staves were bucked and split or hewed.

*Sawed staves—Alcoholic stock.*

| Kind. | Timber. | Number. |
|---|---|---|
| Bourbon | White oak | 18,423,000 |
| Spirit and wine | do | 15,117,000 |
| Half barrel | do | 3,548,000 |
| Total | | 37,088,000 |

*Bucked and split or hewed staves—Alcoholic stock.*

| Kind. | Timber. | Number. |
|---|---|---|
| French claret | White oak | 7,687,000 |
| Bourbon | do | 4,470,000 |
| Spirit and wine | do | 1,522,000 |
| Seconds | do | 1,438,000 |
| West Indian | do | 989,000 |
| Half barrel | do | 291,000 |
| Pipe | do | 95,000 |
| Miscellaneous | do | 171,000 |
| Total | | 16,693,000 |

*Sawed staves—Oil, packing-house, and sirup stock.*

| Kind. | Timber. | Number. |
|---|---|---|
| Oil and tierce | White oak | 76,930,000 |
| Do | Red oak | 6,545,000 |
| Pork | White oak | 6,060,000 |
| Sirup | Gum | 2,431,000 |
| Oleomargarine | White oak | 1,126,000 |
| Sirup | Cypress | 80,000 |
| Miscellaneous | Ash | 314,000 |
| Cut-offs | White and red oak | 11,721,000 |
| Total | | 105,207,000 |

*Heading.*

| Kind. | Timber. | Number of sets. |
|---|---|---|
| Bourbon | White oak | 1,763,000 |
| Spirit and wine | do | 1,197,000 |
| Oil and tierce | do | 3,734,000 |
| Half barrel and keg | do | 1,099,000 |
| Pork | do | 208,000 |
| Do | Ash | 29,000 |
| Total | | 8,030,000 |

**Figures on Pulpwood**

The work of the Forest Service in gathering statics of forest products for the past year has furnished the basis for a provisional statement of the

wood consumed in the manufacture of paper pulp. As the accompanying table shows ,the returns from 159 firms, controlling 232 pulp mills, give over 3,000,000 cords as the total amount of wood used.

| Wood. | Cords. |
|---|---|
| Spruce (domestic) | 1,564,000 |
| Spruce (imported) | 614,000 |
| Poplar (domestic) | 274,000 |
| Poplar (imported) | 22,000 |
| Hemlock | 370,000 |
| Pine | 57,000 |
| Balsam | 22,000 |
| Miscellaneous | 93,000 |
| Total | 3,016,000 |

The wood used was divided among the various processes as follows: Sulphite, 1,538,000 cords; soda, 410,000 cords; ground wood, 1,068,000 cords. The total pulp production by all processes by the firms reporting was 1,993,000 tons. According to the census of 1900, the consumption of pulpwood was then 1,986,310 cords, so that there has been an increase of over 50 per cent in the last six years. This demonstrates, in a striking manner, the drain upon the forests caused by the pulp industry.

**Wood Used in Box Making**

The returns received by the Forest Service showing the woods used in box making in New England during the past year make possible the following preliminary statement.

The first table shows that 292 box factories used 600,493,000 feet of lumber, valued at $8,831,000 delivered at the factories:

| Kind of wood. | Feet. | Per cent. |
|---|---|---|
| White pine | 491,302,000 | 81.1 |
| Spruce | 59,354,000 | 9.9 |
| Hemlock | 25,945,000 | 4.4 |
| Beech, Birch, Maple | 8,442,000 | 2.0 |
| Fir | 7,964,000 | 1.4 |
| Other woods | 7,486,000 | 1.2 |

Under "other woods" are included poplar, chestnut, basswood, pitch pine, and a small quantity of yellow pine.

The second table shows the percentage manufactured by each state:

| State. | Per cent. |
|---|---|
| Massachusetts | 48 |
| New Hampshire | 21 |
| Maine | 20 |
| Vermont | 7 |
| Connecticut | 2 |
| Rhode Island | 2 |

The above figures include the lumber used in making all kinds of boxes, such as lock-corner, dovetail, and nailed boxes, and box shooks.

The consumption of 491,302,000 feet of white pine, or nearly five times as much as of all other woods combined, shows its great importance to the box makers of this region.

**New Forest Reserves**

The Ashland Forest Reserve, in Oregon, has just been enlarged, and the Vernon Forest Reserve, in Utah, created by proclamation of the President.

The expansion of the boundary of the Ashland Reserve has been made for the purpose of including more fully the watershed of Ashland Creek, which is the source of water supply for the city of Ashland and for a large territory of agricultural land in that vicinity. The reserve, which was originally established upon request of the common council and board of trade of the city of Ashland, presented in a memorial and petition to the President, includes a rough, mountainous tract, covered largely with timber of an inferior quality and a dense growth of underbrush needed as a protection cover to Ashland Creek.

The narrow strip of country which has been added to it is of a similar character, consisting of a tract lying along the summit of a spur from the Siskiyou Mountains, which has an average elevation of about 7,200 feet, and culminates in one of the most prominent landmarks in southern Oregon, known as Siskiyou Peak, or Ashland Butte, which rises to a height of 8,025 feet.

The tract is unfit for cultivation and has no settlements on it. As, how-

ever, it forms the watershed of various tributaries to Ashland Creek, it is important to insure proper protection to its forest cover and to prevent the streams from being contaminated in any way. This will now be carefully attended to by the forest officer in charge of the reserve.

The Vernon Reserve, containing 68,000 acres, lies in the extreme southeastern corner of Toole county, Utah, embracing the southern end of the Onaqui Range, which rises in places to a height of about 9,500 feet, and forms the two divides between Rush, East Rush, and Skull valleys.

The streams flowing from this tract are essential to the settlers at the heads of these valleys, who depend upon them at present for the irrigation of about 3,000 acres of land. Formerly, the water supply was much more abundant. In the days of the early settlement of this locality, the streams are said to have been three times their present size, and to have been used all the way down the valleys. In Rush Valley water made its way in the spring as far north as Stockton Lake, and the south end of the valley supported a population of 300 people, while now there are not more than 100 people there. Stockton Lake, at that time, covered an expanse of two by five miles, fed mostly by streams flowing from the hills which have been included in this reserve; and there were also 200 or 300 acres of wild hay meadows. Now, both the lake and meadows have dried up; and as the result, the ranches south of the lake have gradually been abandoned, until the population is now less than one-third its former size.

An official examination of this region to determine the cause of this lessening of the waterflow, has resulted in showing that the change in conditions during the past twenty-five years has been caused by overgrazing on this watershed, and that protection to the headwaters of the streams is essential if settlement is to continue in these valleys.

**Beasts of Prey on Reserve Ranges**

Wolves and mountain lions are giving the stockmen a good deal of trouble on the ranges in several of the National forest reserves. Vigorous complaints have been made to the Forest Service of the loss of cattle and sheep, particularly cattle, from this cause. Protection is sought by the stockmen, and the Forest Service, which collects a fee for the grazing permits, has promptly assumed the task of finding and putting into effect practical measures to aid the cattle owners in exterminating the destructive animals.

The chief difficulty has been on the Wind River Division of the Yellowstone reserve, in Wyoming. Some of the livestock companies in the region assert that the wolves are increasing so rapidly that the future welfare of the cattle industry is in serious danger. Among the proposals which these conditions have called forth are that a bounty be offered for the animals' destruction. The stockmen along the northern boundary of the Gila reserve, in New Mexico, and in the Wichita, in Oklahoma, have suffered almost as severely.

Last spring the government appointed John Goff, the skillful hunter who acted as guide to the President during his hunting trip a year ago, as Forest Ranger, and set him to hunting "lions" in the Shoshone Division of the Yellowstone reserve, in Montana. Now that the appeal from the stockmen on other reserves is so vigorous, especially for the extermination of the wolves, the Service has just sent an expert into the field to study the wolf problem. The man selected for this work is a recognized authority on the game and other wild animals of the country, Mr. Vernon Bailey, Chief Field Naturalist of the Biological Survey, from which he has been temporarily transferred in order to secure his services for this important project.

The animals which are causing so much trouble to stockmen are common in their native habitat, but are little known to Easterners who have not hunted them. The wolf is known in the West as the "timber" wolf. Though not large, it is powerful and quick. Not only does it kill calves and yearlings with ease, but it attacks and overcomes full-grown cattle. When after this larger prey it does not go for the

throat, as so many beasts do, but fastens its teeth in the muscles of the leg, hamstringing its victim, which falls defenseless. But little of the carcass is usually devoured by the wolves. The "lion" is, of course, the cougar, and no true lion at all. Nevertheless, it is a large and powerful beast, capable of playing havoc among the cattle.

The wolves and lions are not classed in the West as game animals, but are regarded as pests and are commonly termed "varmints." Wherever they are plentiful a bounty is offered to encourage their extermination. Despite this, they are still sufficiently numerous to work much harm, and it is said that in some localities they are on the increase.

It is particularly notable that there has been so much complaint from the Wichita reserve, which the President has set aside as a game refuge. The wolves and cougars are the enemies of other wild animals, and the sportsman, who desires to encourage American sport and to preserve American game, can be counted on to aid in the work of hunting them down.

In any case, however, the lion and the wolf must be driven from the ranges. Interests larger and more substantial than those of the huntsman and trapper demand it. The great live-stock industry, which the Forest Service has pledged itself to encourage in all legitimate directions, has had to pay heavy costs in the loss of cattle, young and full grown. That those holding permits may be assured the full enjoyment of their privilege unmolested, every effort will be made by the government to co-operate with the stockmen in protecting herds grazing on the reserves from attack.

# WASHINGTON STATE NOTES

State Fire Warden Welty, of Washington, will ask the prominent timber owners and mill men of the State to contribute to the fund to maintain the forestry service during the year. The last State legislature appropriated money for this and provided for additional appropriations from the counties, but much of this money is not available and the fund has been exhausted. Therefore, in order to continue the service the mill men will be asked to make necessary contributions.

The Waha Land and Water Company has opened bids for the construction of 22 miles of ditch, three tunnels and two immense dams, the contract prices for which will aggregate about $500,000. The work is a part of the big irrigation system which the water company will establish south of Lewiston, Idaho, to reclaim 20,000 acres of land. The work completed will cost three times this initial expenditure. The present work will irrigate about 8,000 acres and will be completed this year.

It is believed that the approval by the Secretary of the Interior of the Prosser-Grieton and Sunnyside irrigation project means a great and rapid development for the central portion of Washington. Reclamation engineers say when the work of irrigation is started, it means the reclamation of 400,000 acres of some of the best soil in the world when supplied with water, and that $10,000,000 will be expended in the coming ten years, beginning at once. In Benton county alone 200,000 acres will be irrigated.

L. MacLean and E. G. Taylor, both of Spokane, have purchased lumber for a flume which will tap Newman lake and irrigate 1,200 acres of land north of Spokane bridge. The flume will be about four miles long. John T. Whistler, of the Government Reclamation Service, says if everything progresses satisfactorily bids for the construction of the government dam of the East Umatilla, Oregon, project will be advertised for about May 1. Practically all those owning lands under the project have signed up in the Water Users' Association.

**Rights of Settlers**

In further consideration of rights of settlers to payment by the United States for improvements made by them on unsurveyed public lands, the Assistant Attorney General in an opinion approved by the Secretary of the Interior, April 12, 1906, states as follows:

" . . . that settlers upon public lands appropriated by the Government for the use in construction and operation of irrigation works, who have made a bona fide settlement and have continued to comply with the law as to residence upon and cultivation and improvement of the land settled upon, are entitled to be compensated for their improvements, although they have not placed t heir claim of record because of the unsurveyed condition of the land. But the bona fide character of the settlement, and the acts of the settler should be clearly established before allowing compensation, when the settler has not indicated his purpose and intent by placing his claim of record, whether from the unsurveyed condition of the land or from other cause."

**Interest in American Irrigation**

The work of the National Government in reclaiming its western arid areas is attracting the attention of other nations. There is a growing demand from Canada and South American governments for information regarding the development of irrigation projects and the methods followed by the United States in obtaining and compiling stream measurements and in making topographic surveys.

One feature of the preliminary work of the U. S. Reclamation Service—that of making a diagnosis of the soil for the purpose of obtaiing the quantity of salts it contains has called forth inquiries from distant India. The irrigators in Bunna Valley in the Punjab province have been having serious trouble owing to the swamping and deterioration of the lower valley lands. The streams draining the Salt Range on one side of the valley carry quantities of salt in solution, and considerable areas have been ruined by this means. Similar conditions exist in some parts of our western country, and the engineers have devised means for successfully overcoming the difficulties. All of the Government projects in such localities are provided with sufficient drainage systems which serve to carry off the harmful minerals in the water. When the topography of the country is such that the salts cannot be carried by means of ditches into the river, they are led into depressions and evaporated.

The accumulated salts have a commercial value which may make their removal profitable. A plan similar to the above has been suggested by the Reclamation Service to the India engineers as one which might tend to ameliorate conditions at Bunna.

**Floods in Arizona**

The Reclamation Service is having its share of trouble with floods in the Salt River Valley, Arizona. Two unusual floods occurred in March, causing considerable damage to private property in the Valley and some delay to the Government work.

During the last flood Salt River took a sharp bend to the south near the intake of the power canal and made it necessary to construct works to prevent serious damage to the canal. The emergency was so great that a large force of men was immediately put to work at this point. The Government has contracted to furnish power to the contractor who is to build the great reservoir dam, one of the highest structures of the kind in the world, and any injury to the power canal would cause severe loss to the contractor.

In Arizona the Reclamation engineers are geing dubbed "rain-makers," as ever since their appearance in Salt River Valley the floods have been of frequent occurrence and of unprecedented volume.

**Nevada Work Progressing**

The construction of the Truckee-Carson project, Nevada, is progressing rapidly. At the present time 85 per cent of the works required to supply the first 160,000 acres is completed. During the present stage of high water in Carson River the Truckee River is not supplying the system, as the flow of the former is ample at this time.

Three vitrified pipe openings have been set in the main canal and water will be delivered to settlers under this part of the system during the month of May. The old and new settlers under the main distributing system are now receiving their supply from it, and with the exception of two districts the lateral systems are now delivering water. It is expected that the entire lateral system will be in working order at the end of the month. On force account work is now being carried on by the Government in six camps 400 men and 450 head of stock are employed.

**Uncle Sam, Cement Maker**

Uncle Sam wants Portland cement and wants it badly. With 24 big irrigation projects under construction requiring hundreds of thousands of barrels of cement the engineers are finding it next to impossible to obtain anything like the quantity needed. The unprecedented demand for this commodity all over the West has already over-taxed the capacity of the mills, and almost without exception the Government's requests for bids are turned down. Apparently no manufacturers west of the Mississippi are able to supply new orders. In reply to inquiries from the Government they state that, owing to the unusual demand new orders cannot be accepted for several months to come. Recently proposals were requested from eight manufacturers and dealers in cement for 2,000 barrels required on an Idaho project. Only one proposal was received and that was at a rate 50 per cent higher than the firm would have sold a few months ago. Still later invitations for bids for several thousand barrels were sent to 23 dealers. Again but one firm submitted a bid, and this was nearly 60 per cent higher than the normal profitable rate of sale by this firm. Other attempts to purchase cement have been similarly unsuccessful.

The Reclamation Service is gravely concerned. It has let contracts for structures involving millions of dollars, and a failure to secure cement as needed, entering as it does so largely in the work, will be disastrous. Owing to the inaccessibility of many of the Government works, the transportation of cement is difficult and costly. This was particularly the case in Salt River Valley in Arizona, where the great distance from existing mills and the expensive wagon haul, made the cost prohibitive. After making thorough investigation of the cost of bringing in cement for the Roosevelt Dam and other structures, the Government erected its own mill and for several months past has been turning out daily hundreds of barrels of first-class cement at a price far below the cost of cement shipped in. It is known that materials required for manufacturing cement of good quality exist near several of the projects, and private parties should embrace the opportunity to go into the business. From the present

outlook, however, the Government seems to have a choice of shipping from the far eastern seaboard or from Europe, or of manufacturing its own cement.

**Water Supply for Yuma**

The town of Yuma, Arizona, lies entirely within the lines of the Yuma reclamation project, and at present has an execrable water system. The water is now pumped directly from the river into settling tanks, and from these is distributed through the mains. Only a small part of the town is supplied with filtered water and the price is almost prohibitory. The climatic conditions being arid and nearly semi-tropical the town requires a larger proportional share of water than almost any other city in the United States.

A recent act of Congress provides that the Government may supply water from its irrigation projects to cities within or adjacent to the irrigated areas, and the citizens of Yuma, by a petition which has been signed by the largest property holders, are urging the town council to make an application to the Secretary of the Interior for a waer right. This will probably be the first application under the new law.

**Carrying Supplies into Roosevelt, Arizona, before the wagon road was completed.**

**Co-operative Crop Experiments**

Present indications are that Western Nebraska is to be one of the first sections to be benefited by the recent arrangement for coöperative crop experiments between the Department of Agriculture and the Reclamation Service. These experiments are to be carried on within the limits of or adjacent to areas covered by irrigation works constructed by the Government, and the stockholders of the North Platte

Valley Water Users' Association in a recent memorial to the Secretary of the Interior requested that land be segrated for reservoir, park, experimental and demonstration purposes. Favorable action has been taken by Secretary Hitchcock on this request.

This work will be of inestimable value in instructing the settlers in the fundamentals of irrigation and demonstrating what may be done in that section by the scientific application of water and by dry farming. An especially interesting feature will be the name with which it is proposed to grace the reservoir. Out of consideration and esteem for the daughter of President Roosevelt the settlers have expressed the desire to christen the artificial body of water "Lake Alice." The lands adjoin the reservoir and are to be parked and beautified with trees, flowers, and shrubbery. Altogether the request is a pretty compliment to the daughter of the man to whose intelligent and persistent efforts the present work of reclaiming the arid West is largely due.

# THE PECOS RIVER FOREST RESERVE

BY

L. P. KNEIPP

THE Pecos River Reserve was the second of the Federal Forest Reserves to have its economic advantages recognized, it having been created in its original form by Presidential proclamation on January 11, 1892, and was increased to its present area by a second proclamation, dated May 27, 1898. It is also entitled to the credit of being the first of all the Federal Reserves to be trod by the foot of the white man, for almost within its limits are the villages first visited by the hard fighting *caballeros* that followed Coronado in his search for the fabled seven cities in 1541. Notwithstanding this fact much of the reserve is still a country whose splendid stands of timber have not yet felt the ever-advancing and all-destroying axe of the railroad tie contractor, whose onward march, however, has halted only at the boundaries of the reserve.

This reserve is situated in about the center of the north half of the Territory of New Mexico, and covers parts of Santa Fe, San Miguel, Mora, and Rio Arriba counties. Topographically it comprises two ranges of mountains known locally as the Santa Fe range, and the Las Vegas range, both of which are spurs of the Sangre de Cristo range, which forms part of the Rocky Mountain system, the altitude ranges from 7,500 feet to 13,350 feet, but the average elevation is from 8,000 to 10,000 feet.

The area of the reserve is 430,880 acres, or a trifle over 673 square miles; approximately speaking this acreage is divided about as follows: Merchantable timber, 200,000 acres; old burns now undergoing the slow process of natural reforestation, 100,000 acres; the balance, 130,880 acres, consists of open park and mountain meadow grazing land, and the barren peaks of the higher mountains.

No figures are obtainable regarding the stand of timber on this reserve, and it would appear that no systematic attempt has been made to estimate it yet; in round figures the reserve contains about a half a billion feet board measure of merchantable timber, averaging thirty per cent. western yellow pine, the balance chiefly Englemann spruce.

The most important factor in forest preservation as applied to New Mexico is the protection of the main watersheds to such an extent as to insure

the most equal and continuous flow of water possible. The reason is most apparent; almost all of the agricultural products of New Mexico are produced by irrigation and as the larger percentage of the population are engaged in agricultural or pastoral pursuits, it is evident that nothing could cause an era of hard times and suffering as general as that which would follow a series of floods followed by a shortage of water.

The Pecos River Forest Reserve is situated upon one of the most important water sheds of the territory. Within its limits are the head waters of the Pecos River which traverses New Mexico and Texas on the way to its junction with the Rio Grande, and whose course may be traced by the number of fine ranches watered by it; and also the head waters of the Mora River whose importance in relation to the agricultural wealth of the territory is almost as great. In addition to these two streams the reserve contains the sources of several very important tributaries to the Rio Grande which before being lost in the sandy bed of the Big River of the North, give life and fertility to thousands of acres of land and thereby sustain a large agricultural population that would otherwise be without resources of any sort.

It is a noteworthy fact that none of the streams above mentioned attain their maximum height until the last of May or during the month of June, at a time when the lower country is becoming parched and dry and when water for irrigation purposes is badly needed; even then the run off is gradual, usually extending throughout a period of from two weeks to a month. Snow balling in June is a common amusement of the summer visitors to the timbered portions of the higher ranges and in some years the pleasure may be enjoyed during the month of July.

In addition to the irrigation features, it might be mentioned that in and adjacent to the reserve are a number of sites for power plants, valueless today, but all of which will some day be utilized. It is hardly necessary to state that the value of such plants will depend upon a steady and continuous flow of water guaranteed by well-forested water sheds.

Next in importance to the protection of the water sheds, at the present time, is the grazing of stock. From 7,000 to 8,000 head of cattle and horses are allowed upon the reserve each year. Sheep and goats are excluded entirely and have been for a number of years. About thirty per cent of the stock grazed under permits is owned by resident ranchers, the balance is held by neighboring stock owners whose ranches are located from one to five miles outside of the reserve and whose interests in the reserve are almost as great as the interests of the residents themselves. The number of permit holders is from 175 to 200, making the average number of cattle and horses owned by each about forty, the holdings ranging from 3 to 430 head, there being one bunch of the latter figure, the next largest being a trifle over 200 head, and the balance very evenly divided. It is apparent that under Government administration there is no monopoly of choice ranges. The grazing areas are allotted with a view of giving each stock owner the most convenient and advantageous range possible, and the small owner no longer has to suffer the injustice of having his range eaten out by the transient cattleman whose interest in the ranges was but temporary, ending when his cattle were taken out of the mountains.

The importance of the reserve as a permanent source of timber supply is hardly recognized yet; still it is daily becoming more apparent that the timber resources of New Mexico are being rapidly exhausted. And it is with astonishing frequency that one hears from representative men the remark "timber is timber nowadays" clearly indicating that the more thoughtful forsee the day when New Mexico, its magnificent forests destroyed, or retarded by indiscriminate cutting, will

need for its development the splendid natural heritage that was sacrificed rather than utilized.

The productive power of the Pecos River Forest Reserve is great, soil, moisture, and heat conditions are of the best, and three quarters of the reserve is land that will produce merchantable timber. At the present time the high cost of production and low timber values make it impossible to completely utilize the timber resources of the reserve, but when the inevitable era of cheap and economical production and high timber values arrives, the reserve should be capable of an annual production of five million feet.

A factor that while of somewhat lesser importance is still worthy of note, is the value of the reserve as a game retreat. Deer are rapidly increasing in number and are so well protected that they display little or no fright at the sight of men. Bear and mountain lions are plentiful as are smaller animals, the rapidly decreasing wild turkey is still to be found though not in large numbers, while there is an abundance of grouse and other game birds. All of the rangers are commissioned game wardens, with the right to make arrests; they are interested in this branch of the work and have had a prominent part in the enforcement of the game laws.

A fact that may be worthy of mention is that private capital is beginning to follow the example of the Government in husbanding timber resources. On the Maxwell and Mora land grants systems of timber inspection have been in effect for some time, inspectors are employed and the rules in force relative to the cutting of timber are in some respects more stringent than those governing the Federal Forest Reserves. A penalty is placed upon the cutting of undersized timber, and upon the wastage of merchantable timber; while the anouncement is made that any person starting a forest fire will be prosecuted under the territorial laws. Another case is that of the Atchison, Topeka and Santa Fe Railroad which owns about a township of timbered land adjacent to the reserve. It has requested a prominent local timber operator to take charge of its holdings and to conduct the cuttings in accordance with the rules and regulations governing timber cuttings in forest reserves; the object being to husband the timber resources of the land and to secure as far as possible a permanent supply of timber.

These movements are signifiant, and indicate that the proclamations that set aside the Pecos River Forest Reserve with the object of protecting the numerous and varied interests connected with it were not made a day too soon.

The serious nature of the problem which confronts the engineers will be appreciated when it is known that since the initiation of the work the Gila has twice so changed its channel and the topography of the country by cutting out in places and building up in others that re-surveys and plans of structure have been made and re-made by reason thereof. The levees are now ready for construction, but until they are completed the uncertainty of the behavior of the Gila renders it unwise to let the work by contract under definite plans as contractors must necessarily be governed by the conditions, and their bids will be made high accordingly. There is urgent need of haste.

The Secretary of the Interior, recognizing these facts and upon recommendation of the board of consulting engineers who investigated the situation, has ordered that the work be undertaken immediately by the Reclamation Service by force account.

# RECLAMATION WORK IN NORTH DAKOTA

BY

H. N. SAVAGE
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THREE pumping projects are under consideration in North Dakota, and drawings and specifications have been developed for each of the three.

The Buford-Trention project contemplates the irrigation of 8,000 acres, which may be increased to 20,000 or more in case the land owners desire to avail themselves of the opportunity. A water users' association has been organized, stock subscriptions made, and a contract is being executed with the Secretary of the Interior which will insure the early construction of the work.

The Williston project looks to the irrigation of 12,000 acres, which may be increased to from 35,000 to 40,000 whenever the land owners make satisfactory arrangements. A water users' association has been organized and a contract will soon be executed and transmitted to the Secretary of the Interior for his approval.

The Nesson project involves the irrigation of 12,000 acres. A water users' association has been organized and stock subscriptions are now being received. It is expected that the land owners will enter into a contract and submit same to the Secretary of the Interior at an early date.

These three projects are located on the left or north side of the Missouri River, in the extreme western part of North Dakota. The fall of the river is so slight that it is not possible to take out a canal and distribute the water by gravity, therefore pumping is necessarily resorted to. The abundance of lignite fuel in the immediate vicinity makes possible the development of power at an economical cost. Very careful topographic surveys were made during the season of 1905 of all the lands in the vicinity of each of these projects. The engineers have made a very careful study of the topography in order to develop the most economical and efficient location for distribution canals.

The plans developed contemplate power stations located adjacent to the lignite mines and the transmission electrically of the power generated. Owing to the changeable current of the Missouri River careful consideration has been given to the establishment of at least one of these pumping stations on a barge. The electrical actuation of the pumps by motor makes this plan not only feasible but very attractive. The pumps would be connected with the canal on shore by flexible joint pipes, and the barge would accommodate itself to variations of water level in the river, and also if the river should move in nearer shore or leave the present shore altogether, the barge could readily follow the channel, and by an extension or decrease in the length of the barge pipe continue to deliver water, thus protecting the irrigated crops against any change in the river.

The land owners are evincing a great deal of enthusiasm regarding the development of these projects, and it is hoped that actual construction can be begun this season. A lively movement in real estate has already taken place in anticipation of the early construction of the works.

# PUMPING WATER

## Second Paper

THROUGHOUT a great part of the arid and semi-arid region there are localities where water can be obtained at a short distance from the surface. The amount, although not large in the aggregate when compared with the quantity in some notable streams or lake, is yet inexhaustible by the ordinary methods of pumping. If, therefore, this water which exists from 10 to 50 feet beneath the surface can be cheaply raised, it will be practicable to utilize it for agriculture tracts which otherwise have little or no value.

The irrigation of 20 acres in the midst of a section or township of land is, figuratively speaking, a mere drop in the bucket; but the reclamation of this small area generally means the utilization of adjoining lands. If, for example, 20 acres of some forage crop like alfalfa is made possible, this will result in obtaining a considerable amount of winter feed used in the sustenance of a herd which can be pastured upon the surrounding dry land. The successful cultivation of this 20 acres may thus directly or indirectly support a family, and, with increased experience and adaptation to the surrounding conditions, the family may in turn give place to a rural community. Given the existence of sufficient water underground to irrigate the 20 acres, the first question is that of ways and means of bringing the water to the surface.

The force which is ever present, making itself persistently felt throughout the Great Plains region, is the wind which blows almost continuously. It carries the dust before it, cuts out the traveled roads, carries away the fine earth of the tilled fields, and builds up a fine loess, almost everywhere to be found. The wind, which has so long been considered as an annoyance and mischief-maker, has sufficient strength to perform the work of bringing water to the surface, if only suitable means of directing its energy can be discovered.

The windmill is the best-known method of converting wind energy into work. In one form or another it has been used from times antedating the dark ages. In the twelfth century windmills, built either by individuals or by communities, were common. Some of these mills were of enormous size. In the German type the whole building on which the windmill was placed was constructed in such a manner as tomturn on a post in order to bring the sails into the wind. In the Dutch form the building was fixed, but the head of the mill could be turned into the wind. The most notabe use of these early mills was in Holland, where the land was drained by pumping water from behind the dikes into the sea. In 1391 the Bishop of Utrecht, holding that the wind of the whole province belonged exclusively to him, gave to the Convent at Windsheim express permission to build a windmill wherever it was thought proper. In so doing he overruled a neighboring lord, who declared that the wind in the district belonged to him. Three years later the city of Haarlem obtained leave from Albert, Count Palatine of the Rhine, to build a windmill, using the wind of the country.

The huge, clumsy windmills of European make, such as that erected at Lawrence, Kan., shown in the accompanying plate, have within a few decades given place in this country to the light, rapidly running forms. Thousands of these have been made by various firms throughout the country. At first wood was used almost exclusively, but this is being rapidly displaced by metal, especially by thin steel plates and forgings. Although millions of dollars have been invested in the manufacture and purchase of mills and much attention has been given to the

mechanical details and the saving in weight and cost, yet comparatively little study has been bestowed upon the actual efficiency of the various forms and upon their development toward theoretical ideals.

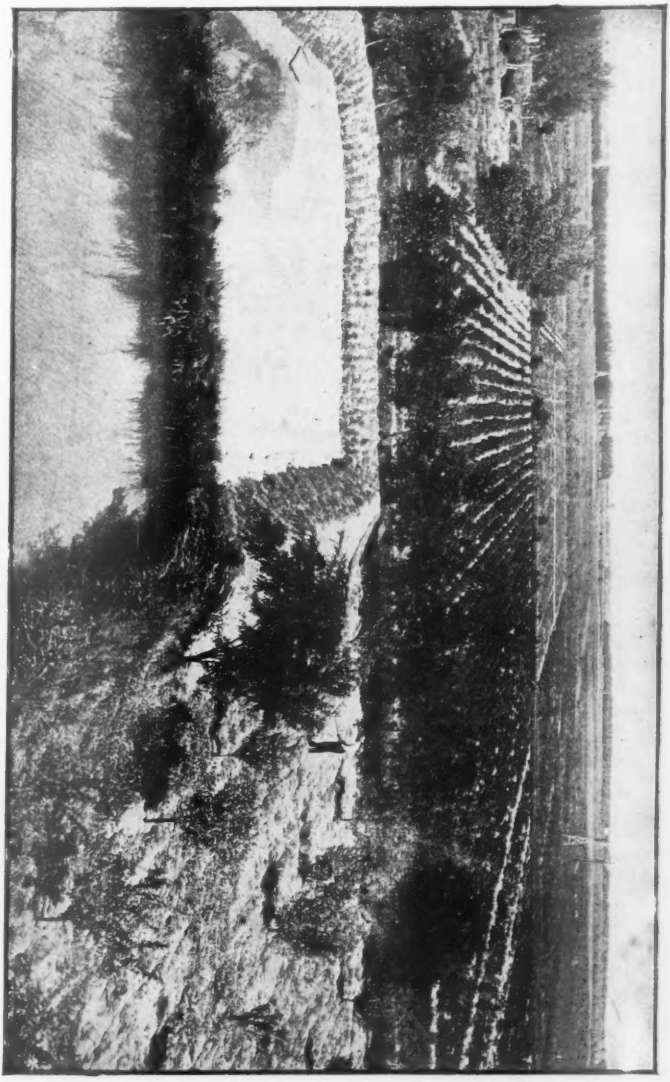
platform. In the foreground is a small reservoir, divided by a bank in the area cultivated. Without windmills the cultivation of the tract of country middle, so that one part may be used independently of the other. The part

**Dutch Windmill at Lawrence, Kansas.**

A view of gardens cultivated by water pumped by windmills is shown in the accompanying plate. This picture has been taken from a windmill

nearer the observer is the older; the second part is a recent addition rendered necessary by the increase of the shown in this picture would be impos-

sible. It is doubtful if a single cow could find subsistence on the area which now supports a family.



Reservoir and Garden

A section through one of these small reservoirs shows at the bottom the puddled earth or clay that prevents the water from seeping into the adjacent ground. On this puddled earth the banks are built at a height of from 4 to 10 feet. These are usually built by plowing and scraping up the earth from the outside, the tramping of the horses and the men serving to consolidate it. When the

bank has been built to the proper height it is smoothed and sodded. On the right-hand side of the figure is the pipe or wooden flume from the windmill and on the left-hand side is shown the outlet box, which is usually built of 2-inch plank. This is closed by some simple form of wooden gate or valve, either lifted by means of a screw or hinged so as to open outward, and is held in place by the pressure of the water against it.

The square reservoir is the form usually adopted. The mills, as in the other cases, are placed on each side, pumping through short wooden flumes over the bank. These reservoirs are not only used for holding water for irrigation, but with a little care serve as ponds for raising fish.

# COST OF RECLAMATION WORK

## How Cost of Western Irrigation Work Compares with Like Work Elsewhere

ONE of the most surprising features connected with the work of the Reclamation Service, as well as the one affording highest gratification, is the cost of structures compared with those which have become familiar to engineers in the East.

When the reclamation work was inaugurated it was a matter of conjecture whether or not the standards of cost for dams, canals, etc., that had been established by engineering practice in the eastern part of the country, could be relied upon as a basis of estimates of the cost of the proposed western structures. As the work has progressed it has become more and more evident that many classes of engineering work in the west can be performed considerably cheaper than in the East, and at the same time the natural conditions are such that these structures are economical and effective.

If we take, for example, the three great masonry dams now being erected for the purpose of storing water, viz.: the Roosevelt dam in Arizona, the Pathfinder dam in southeastern Wyoming, and the Shoshone dam in northwestern Wyoming, we shall find that the effective storage capacity and costs are far below those of some of the great eastern dams like the New Croton in New York, and the Wachusett in Massachusetts. The heights of these dams are as follows: Roosevelt, 280 feet; Pathfinder, 210 feet; Shoshone, 308 feet; New Croton, 297 feet, and Wachusett, 207 feet. These heights are measured from the foundation stones to parapet in each case, and they show that the Shoshone is the highest, while the New Croton is second and the Roosevelt third. If, however, the height above the river bed be considered, that is, the effective storage height, the New Croton is the lowest. The order is then as follows: Shoshone, 240 feet; Roosevelt, 230 feet; Pathfinder, 200 feet; Wachusett, 185 feet ,and the New Croton, 157 feet. In other words, about 50 per cent of the masonry in the New Croton dam is below ground and is serviceable for foundation purpose only.

It is interesting to note the comparative reservoir capacities. While the New Croton dam is the largest in the world from the standpoint of its amount of masonry, the storage capacity of the reservoir formed by it is by far the lowest of any of those above mentioned. In fact, from a standpoint of storage economy, the New Croton reservoir is one of the poorest that has been constructed in recent years. The dam contains 833,000 cubic yards of masonry and was erected at a cost of $7,600,000. The capacity of the reservoir formed by it is 4,000,000,000 cubic feet, or a cost of

$1,900 per million cubic feet storage. Similar figures for the Wachusett dam show that it contains 280,000 cubic yards of masonry, and was erected at a cost of about $2,000,000. Its storage capacity is 8,400,000,000 cubic feet, or a cost of $238 per million cubic feet storage. In contrast to these excessive costs the three western dams appear remarkable. The Roosevelt dam, for example, contains 350,000 cubic yards of masonry erected at a cost of $3,850,000. The capacity of the reservoir is 61,000,000,000 cubic feet, or fifteen times that of the New Croton, and about seven and one-half times that of the Wachusett. The cost of this dam per million cubic feet storage is only $63.16. Even more remarkable appears the Pathfinder dam. It contains 53,000 cubic yards of masonry, erected at a cost of $1,000,000. The capacity of the reservoir is 43,560,000,000 cubic feet, or more than ten times that of the Croton. The cost of the dam per million cubic feet storage is therefore only $22.95 as against $1,900 for the New Croton, and $238 for the Wachusett. Similar figures for the Shoshone dam, the highest in the world, are: Cubic yards of masonry, 69,000; cost, $1,000,000; capacity of reservoir, 20,000,000 cubic feet, or a cost per million cubic feet storage of $50.35.

These extremely low costs have seldom been equalled in the history of reservoir construction, and are due largely to the excellent natural facilities which are found in the rugged western country. From this fact it must not be inferred that these western structures are simple engineering works. On the contrary, owing to their isolated location, their inaccessibility by rail and often by wagon, and the erratic and torrential character of the streams, they involve problems which tax the skill and ingenuity of their builders to the utmost.

It is most fortunate that these reservoirs provide enormous storage at relatively low cost, otherwise their construction would not be feasible, as the irrigated land could not bear the expense of the costly structures of the East with their limited storage capacity.

The Croton dam, if it had been constructed in Salt River Valley in Arizona for irrigation, would only supply 23,000 acres, and irrigators would have to pay $330 an acre for stored water, as against $20, the estimaed cost from the Roosevelt dam.

**The Forester. A Practical Treatise on British Forestry and Arboriculture for Landowners, Land Agents, and Foresters.** By John Nisbet, 2 Vols. Illustrated. Pp. 506-642. William Blackwood & Sons, Publishers, Edinburg.

This is in many ways the most important book on forestry that has yet appeared in English. As the author says in his preface, it is neither a reprint nor a revision of the work by John Brown, and Brown and Nisbet, which, under the same title has gone through six editions, but is an entirely new production. The general character of the book is indicated in its sub-title, and the broad distinction made between forestry and arboriculture is worth noting. The difference is too rarely recognized in this country.

The fact that the book is avowedly written from the British point of view, and for the guidance of British cultivators, limits its usefulness here in a very large measure; yet we have so few books on the subject in English that one is disposed to value this for the many important things it does contain. What does not apply may be overlooked.

In a lengthy introduction (Part I) are given an historical sketch of forestry and arboriculture in Britain, facts and statistics relative to British woodlands, and a discussion of forest influences and the economic value of forests. The last is of general application and interest, and brings together many facts not available to one who reads no language but English.

Part II considers individually the tree species of the British Isles, the large number that have been introduced as well as those that are native. The effort is made to describe each tree botanically, silviculturally, and economically, and while there is evidence of much painstaking, the statements made are often faulty. For instance, it is said of Douglas Fir, "the best wood comes from moderate elevations on the west slopes of the Rocky Mountains, and is of great durability." Even in the British part of its range the tree is best developed and produces the best timber west of the Cascade Mountains, and the wood is nowhere considered very durable. Again, it is said "The wood of the Scarlet Oak is of little value. It is so porous and open of texture that even in America it is chiefly used for making staves for dry-goods barrels. It does not even make fair fire-wood." With respect to common names there is the usual confusion: *Pinus sylvestris, L.* is Scots Pine, or Common Fir," *Acer Saccharinum L.* is "Soft Sugar or Bird's Eye Maple" and *Pseudotsuga Douglasii* Carr. is "Red Pine." The last name is used locally only in some parts of the Rocky Mountains, whereas Red Fir is the common name in the lumber trade.

Part III is devoted to silviculture and presents in a very satisfactory way the accepted European practices. An American is always dissatisfied with this part of every work on forestry, because the methods are based upon rules of practice instead of upon principles of universal application. It may be reasonably expected that before long American foresters will answer the need for a true system of silviculture based upon natural laws.

Part IV deals with the protection of woodlands from ill influences of every kind. The chief value of this section is in its suggestions because injury to forests and trees is so largely a question of local conditions.

Part V treats of forest management and Part VI of forest products. Both sections are written for the British practicant, and consequently have a restricted value here. The theoretical principles of forest management are well presented, however, and one is glad to find the various formulæ for determining rotation, rate of increment, etc., in such convenient form. The tables in the appendix to Part V are especially valuable. What is said of the technical properties of timber is valuable as a compilation of the known facts, but the author himself doubtless realizes how little definite, exact knowledge there is on this subject. The chapters on forest utilization have little application here. The terminology frequently differs from that commonly used in the United States, and some words are worth adopting. *Felling*, for instance, in place of *cutting*.

To the American forest student this book comes as a boon and the professional will often want to refer to it. Numerous faults and many shortcomings might be pointed out, but as a whole the book will be found

almost indispensible. It is sparingly illustrated with good wood cuts and half-tone engravings, and is furnished with that indispensible in a hand-book—a good index.

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**A Working Plan for Forest Lands in Central Alabamb. Bulletin No. 68, U. S. Forest Service.** By Franklin W. Reed. Pp. 72, with map and four half-tone plates. Washington, Government Printing Office, 1905.

Just at this time when the forest resources of the South are being discussed by reason of the pending Appalachian Forest Reserve Bill, this bulletin, although describing a section outside of the proposed reserve, is nevertheless quite interesting. The plan described was prepared for the Kaul Lumber Company, of Birmingham, for lands in Coosa, Bibb, and portions of adjacent counties.

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**Davey's Primer on Trees and Birds** By John Davey, author of "The Tree Doctor." Pp. 165. Profusely illustrated. Published by the author. Sewickley, Pa.

This handsome little volume is written in popular vein and simple language, to be used as a school reader and generally as an elementary treatise on tree and bird life. The author has found that the most practical suggestions looking toward the proper preservation of tree and bird life is "to teach the child." The volume before us was undertaken purely with this idea in view, and should be a help in creating a proper sentiment toward trees and birds. The illustrations are many and exceedingly clear.

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**Neighbors of Field, Wood and Stream.** By Morton Grinnell. Forty-five illustrations. Pp. 285. Frederick A. Stokes Co., Publishers, New York.

This volume contains a delightful series of stories about the commoner species of birds, beasts, and fish of the Eastern United States. It plans to make known to the younger generation the habits and home life of our wild neighbors. With the idea of giving the subject a real and living interest, he has endowed the birds and beasts described with human intelligence, which undoubtedly is an attractive way to present such matter to young readers. The illustrations are unsually pleasing and appropriate. Altogether it is a book well worth adding to one's collection.

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**A Guide to the Wild Flowers.** By Alice Lounsberry. Illustrated by Mrs. Ellis Rowan. Pp. 347. Profusely illustrated with line drawings and colored plates. Fourth edition. Published by Frederick A. Stokes Co., New York.

In this work one gets as complete and accurate a guide in wild flowers as is obtainable in one volume. Its value is appreciated, as shown by the fact that the book has gone through four editions. The arrangement of the text throughout is one of great simplicity and clearness, while the many illustrations are a great aid to the identification of the various species described. We know of no more valuable and useful publication of a popular character devoted to the wild flowers.

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**A Guide to the Trees.** By Alice Lounsberry. Pp. 313. Profusely illustrated. Published by Frederick A. Stokes Co., New York.

This is a companion volume to Miss Lounsberry's Guide to the Wild Flowers, and is uniform in arrangement, illustrations, and general makeup with the latter work. Its value lies in the same direction—simplicity, clearness of descriptions, and full enough to satisfy the most ambitious student of our leading trees. Nearly 200 trees are described, besides a number of shrubs. Its illustrations include 64 colored plates and many black and white drawings and diagrams by Mrs. Rowan, who also illustrated the volume on wild flowers. The volume also contains an introduction by Dr. N. L. Britton, Director of the New York Botanical Garden.

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**Hardy Rhodendrons, Azaleas, and the Mountain Laurel.** By J. Woodward Manning. Manning's Monographs, March, 1906, No. 2. Pp. 36, illustrated.

From the Reading nurseries, at Reading, Mass., comes this excellent little booklet, pleasing in its typographical excellence and in contents. The plants are exhaustively described and directions for their care given.

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**The Fern Collector's Guide.** By Willard Nelson Clute. Pp. 61. Illustrated. Frederick A. Stokes Co., New York.

This handy little book has been published with the idea of showing the student "where to find and how to name the ferns." It is most conveniently arranged for ready reference, and is enhanced in value by many excellent text illustrations. This guide is based upon the more extensive writings by same author, and should meet with a warm reception from fern collectors.

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**Silas Strong. A Novel.** By Irving Bacheller. Pp. 339. Price $1.50. Harper & Brothers, New York, 1906.

"Silas Strong," with the sub-title of "Emperor of the Woods," is a tale of life in the Adirondacks. Aside from a story that

would be entertaining no matter where the scenes were laid, the book contains a strong and reasonable plea for the preservation of the Adirondack forests. It shows the present tendency in the "Great North Woods" and the conflicting interests that are threatening the destruction of America's most beautiful playground. The people and legislators of New York especially, might read this book with profit to the state property.

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**Advice for Forest Planters in Oklahoma and Adjacent Regions. Bulletin No. 65, U. S. Forest Service.** By Geo. L. Clothier, M. F. Pp. 46, illustrated. Government Printing Office, 1905.

This bulletin contains advice on the methods of planting trees, proper species for planting, care of planted trees, and general suggestions to forest planters in the region covered. The information here published has been collected by agents of the Forest Service chiefly in connection with the making and execution of forest planting plans for different land owners in the region, and was issued because it was felt there was a general lack of definite information regarding forest planting.

**The Black Hills Beetle, With Further Notes on its Distribution, Life, History and methods of Control. Bulletin No. 56, Bureau of Entomology, U. S. Department of Agriculture.** By A. D. Hopkins, Ph. D. Pp. 22, illustrated. Government Printing Office, 1905.

The Black Hills beetle has killed between 700,000,000 and 1,000,000,000 feet of western yellow pine timber in the Black Hills Forest Reserve, where it is found in abnormal numbers and lately its depredations in central Colorado and New Mexico have become extensive. The report here presented is the result of an investigation undertaken by Dr. Hopkins and his assistants, at the request of the Forest Service, and contains in addition to a description of the beetle, its habits and life-history, a method of control, devised and tested by Dr. Hopkins. The actual discovery of the beetle and its identification as a new species by Dr. Hopkins occurred in 1900. Owing to the serious nature of the beetle's depredations, it was felt that a full investigation should be undertaken to determine its character and extent, and the bulletin here presented is the final report of such investigation.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 8, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Billings, Montana, until 2 o'clock p. m., June 20, 1906, for the construction of about 17 miles of canal, involving approximately 350,000 cubic yards of excavation. Plans, specifications, and proposal blanks may be obtained from the Chief Engineer, Reclamation Service, Washington, D. C., or from the Engineer, Huntley, Montana. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., April 26, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, at Mitchell, Neb., until 2 o'clock p. m. June 15, 1906, for the construction of about 135 miles of distributing system involving about 720,000 cubic yards of earth work and 11,000 cubic yards of rock work, for the irrigation of lands in the North Platte Valley in Western Nebraska. Particulars may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C., or the Engineer, Mitchell, Neb. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., April 26, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Ore., until 3 o'clock p. m., June 28, 1906, for building the Cold Springs Dam, near Hermiston, Ore., including about 694,000 cubic yards of earth and gravel excavation, about 3,100 cubic yards of rock excavation, about 3,110 cubic yards of concrete, and about 35,000 cubic yards of rip rap and rock fill. Particulars may be obtained at the office of the U. S. Reclamation Service, at Washington, D. C., Portland, Ore., and Hermiston, Ore. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., April 23, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Ore., until 2 o'clock p. m., June 27, 1906, for the following work: Storage works near Conconully, Wash., including about 258,000 cubic yards of earth excavation, 29,000 cubic yards of rock excavation, 160 feet of tunnel, and 2,360 cubic yards of concrete. Particulars may be obtained at the offices of the U. S. Reclamation Service at Washington, D. C., Portland, Ore., and Pogue, Wash. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., April 21, 1906. Sealed proposals will be received at the office of the Reclamation Service near Belle Fourche, S. Dak., until 4 p. m., May 29, 1906, for the completion of the Main Supply Canal, Belle Fourche Project, South Dakota, from Station 80 to terminus, involving the excavation of approximately 200,000 cubic yards, more or less of material. Specifications, form of proposal and plans may be obtained from the Chief Engineer, United States Geological Survey, Washington, D. C., or from R. F. Walter, Engineer in Charge, Belle Fourche, S. Dak. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 12, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Klamath Falls, Ore., until 2 o'clock p. m., June 21, 1906, for the construction of 19 miles of canal, and 27 miles of laterals in Klamath County, Ore., with checks, turnouts, culverts, bridges and other appurtenances involving about 570,000 cubic yards of excavation, 1,550 cubic yards of concrete masonry, and about 35,000 feet B. M. of lumber. Plans, specifications and forms of proposal may be obtained by application to the Chief Engineer of the United States Reclamation Service, Washington, D. C., the Supervising Engineer, 1108 Union Trust Building, Los Angeles, Cal., or the Project Engineer, Klamath Falls, Ore. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 3, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Ore., until 2 o'clock p. m., June 29, 1906, for the construction of about 25 miles of canal extending from the Umatilla River, near Echo, Ore., to the proposed Cold Springs Reservoir, consisting of the following work: About 700,000 cubic yards of earth excavation, about 6,000 cubic yards of rock excavation, about 2,300 cubic yards of concrete, and about 3,600 cubic yards of riprap, divided into two schedules. Particulars may be obtained at the offices of the United States Reclamation Service, Washington, D. C., and Portland, Ore. E. A. HITCHCOCK, Secretary.

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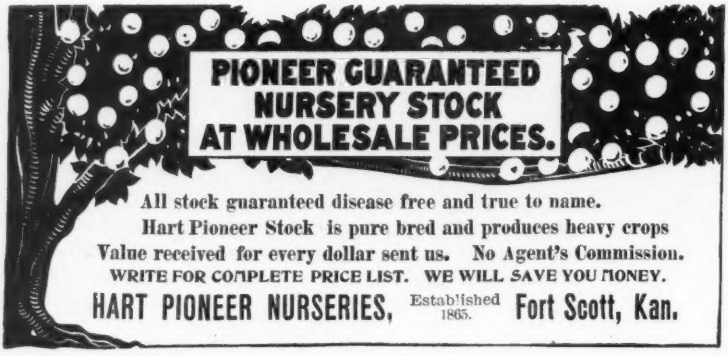


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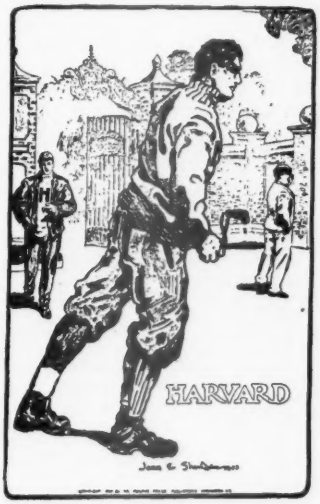

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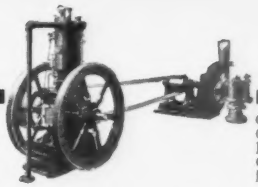

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